MORRIS L. BIGGE

LEARNING THEORIES FOR TEACHERS

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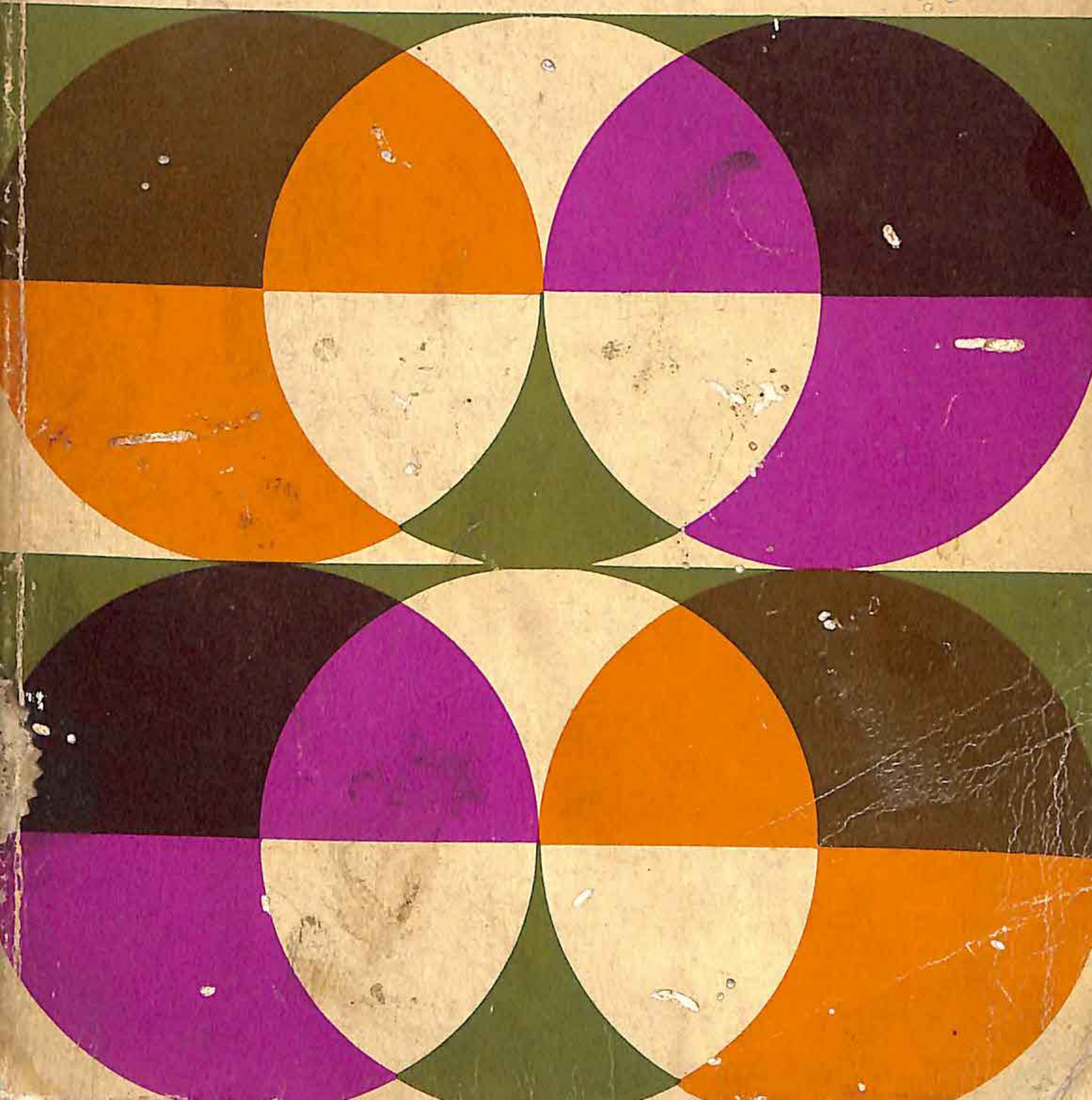

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Learning
Theories
for Teachers

HARPER'S SERIES ON TEACHING

Under the Editorship of Ernest E. Bayles

Learning Theories for Teachers

MORRIS L. BIGGE

Fresno State College

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Editor's Foreword

THIS IS A SCHOLARLY, yet thoroughly down-to-earth study of the aspects of learning theory that have direct bearing upon schoolroom practice. It is a comparative study: each view is followed into the impact it should (if adopted) have upon teaching. This book, therefore, is a highly practical one, especially so because it embodies *the* feature essential to genuine practicality—*theory* that is followed into its logical implications in terms of practice. The points of view treated are those actively influential today, hence those that need to be understood by teachers so they can be discerning in their classroom procedures, as well as in their reading of educational literature or their participation in professional discussions. This is a pertinent, hence important, book.

Few, if any, writers in educational psychology are more lucid than is Dr. Bigge. He intends to communicate, and does. He does not "talk down" to his readers; he simply states things clearly.

Moreover, he is fair, though he makes no pretense of being neutral. He has his own convictions and makes clear what they are, but takes pains to present opposing or alternative views in ways satisfactory to their sponsors. When he presents a view, he furnishes sufficient documentation to demonstrate the validity of his presentation. Nothing is taken out of context. In fact, it is the full context of each learning theory upon which he insists, a context sometimes presented more fully by him than by proponents of a given view. My personal conviction is that few texts now available in educational psychology will be more helpful to teachers than this one.

ERNEST E. BAYLES

January, 1964

Preface

THIS BOOK IS DESIGNED for use as a basic text in courses in *learning theory* or a collateral text in *educational psychology* or *psychological foundations of education*. It should also prove useful as a supplementary text in other courses which emphasize the nature of contrasting psychologies of learning. The objective of the volume is to provide prospective and in-service teachers, at all levels, with a comprehensive picture of modern learning theories in as readable style as is possible without oversimplification of the basic tenets, similarities, and differences of most of the important contemporary learning theories.

The book describes learning theories in such a way as to guide readers in critically constructing and evaluating their own outlooks in regard to the nature of the learning process and formulating their optimum roles in its promotion. Thus, it is written with the hope that it will contribute, in some degree, to a long-range sense of direction which will be conducive to more effective teaching.

The author does not claim absolute impartiality; his sympathy lies with the cognitive-field theory of learning. Nevertheless, every effort has been made to provide a balanced treatment of learning theories. Consequently, the book should be equally usable by professors with various theoretical commitments. Each theory is presented much as if the writer were an adherent of that point of view. The volume contains occasional critical comments and evaluations, but they usually are weighted toward supporting the theory then being discussed. In most cases, it is left to readers to discern the weaknesses of each theory in relation to contrasting theories.

Since a truly comparative approach to learning theory is necessarily semihistorical, this volume treats respective learning theories semihistorically as well as comparatively. The historical analysis which is employed is developed in such way as to help readers grasp and clarify points of confusion in modern education. Many contemporary educational principles and practices are something of a hodgepodge, rooted in premises about the nature of man and his relationships with his physical-social environment which frequently are incompatible with one another. By recounting how psychological assumptions and theories arose and how they evolved over time, the book helps readers see why the theories exist and the directions in which they point. Since some earlier theories of learning, which are seldom advocated now by professional psychologists, continue to influence today's teaching, they too are considered along with contemporary learning theories.

The general plan of the book is as follows: Chapter 1 lists the theories which are to be treated and introduces readers to various possible assumptions about the basic nature of man. Then Chapter 2 presents the more prominent representatives of pre-twentieth century learning theory—mental discipline, natural unfoldment, and apperception—and develops their implications for school practice. Chapter 3 introduces the two major contrasting twentieth-century "families" of learning theory—S-R associationisms and Gestalt-field theories. It also provides background by explaining how the families arose and how they relate to mechanistic and relativistic outlooks. Chapter 4 focuses on the specific explanation of learning which each contemporary family offers.

Chapters 5, 6, 7, and 8 are somewhat more technical and specific than are Chapters 2, 3, and 4. They are written to give readers a "feel" for how psychologists think and work within their respective points of view. Since space does not permit treatment of all prominent contemporary learning theories, only representative ones are described. Chapters 5 and 6 describe two systematic versions of S-R associationism—B. F. Skinner's *operant conditioning* and Kenneth W. Spence's *quantitative S-R theory*. Both Skinner and Spence are greatly interested in the psychology of learning, but their positions in regard to psychologists' contribution to education are quite different. Whereas Professor Skinner represents his psychology as the great hope for improvement of current instructional techniques, Professor Spence feels that in its present stage of development psychology has little to offer schools. He is hopeful for the future of psychology, but he thinks that much more research is needed before this science can make any major contributions to teaching procedures.

Chapter 7 develops the basic concepts of *cognitive-field theory* which perhaps is the most promising representative of the Gestalt-field family. Chapter 8 then applies cognitive-field psychology to learning and teaching and proposes how this psychology might provide a possible basis for synthesizing presently opposed learning theories.

Chapter 9 delineates the outlook in regard to *transfer of learning* which harmonizes with each learning theory. Its content grows directly from, and thereby constitutes a summary of, the content of earlier chapters. Chapter 10, through summarization of some learning principles which are fairly well agreed upon irrespective of the school of thought to which educational psychologists belong, reminds students of the existence of some areas of common agreement. Finally, Chapter 11 develops the relationships of respective learning theories to classroom practices. It centers upon three levels of learning and teaching—memory, understanding, and reflection.

Psychological Foundations of Education by Dr. Maurice P. Hunt and the author of this book has been a forerunner, and to some degree a progenitor, of this volume. In fact, Chapters 2, 3, 4, 5, and 10 are revisions of Chapters 10, 11, 12, 13, and 15 of *Psychological Foundations of Education*. Chapters 1, 6, 7, 8, 9, and 11 are new, but some of them also draw heavily from the earlier volume.

The volume has been thoroughly classroom-tested. All chapters have existed in either mimeographed or printed form for a year or more, and some students in the author's classes have been asked to write critical reviews of every chapter. The manuscript figuratively has been "ripped to shreds" by hundreds of students, and many of their valuable suggestions, in one way or another, have been incorporated into it.

The author is indebted to so many people for their contributions toward making this book a reality that any attempt to name them all would be futile. These include his former professors, especially the late Dr. T. L. Collier of Washburn University and Dr. Ernest E. Bayles of the University of Kansas; his former students, both graduate and undergraduate; and his colleagues on the Fresno State College staff who have read parts or all of the manuscript and made many valuable criticisms.

Dr. Maurice P. Hunt, Dr. and Mrs. Kenneth W. Spence, Dr. Wayne B. Holder, Mrs. Mabel Hunt, Mrs. Ada Bigge, and Miss June Lee Bigge each have made unique contributions to the manuscript. My colleague, Dr. Hunt, has granted permission to use materials from *Psychological Foundations of Education* and has ably edited and criticized the new chapters in the manuscript. Dr. and Mrs. Spence both read a late draft of Chapter 6 and provided marginal notes and suggestions which were inestimably valuable to the writing of the final draft of the chapter. Dr. Holder examined an early draft of Chapter 6 and helped the author avoid some pitfalls in describing this rather difficult point of view. Although the author has received great assistance from these individuals, he assumes complete responsibility for the quality of the final manuscript.

Mrs. Hunt prepared the manuscript for the publisher in a masterly fashion. Mrs. Bigge, by manifesting the confidence in the author which only could be held by a good wife, and by assisting in editing the final proofs of the book, has helped invaluably. Finally our daughter, June Lee—an experienced master teacher—attended all sessions of a class in which drafts of the manuscript were used as text material and assiduously took notes on all class criticisms and reactions. These notes were of great help in the final refining of the manuscript.

MORRIS L. BIGGE

January, 1964

Learning Theories for Teachers

CHAPTER 1

Why is classroom learning a problem?

Maturation or *learning,* or a combination of the two, is the means by which changes in students occur. Maturation is a developmental process within which a person from time to time manifests different traits, the "blueprints" for which have been carried in his cells from the time of his conception.

Learning, in contrast with maturation, is a change in a living individual which is not heralded by his genetic inheritance. It may be a change in insights, behavior, perception, or motivation, or a combination of these.

"Learning is basic to the development of athletic prowess, of tastes in food and dress, and of the appreciation of art and music. It contributes to ethnic prejudice, to drug addiction, to fear, and to pathological maladjustment. It produces the miser and the philanthropist, the bigot and the patriot. In short, it influences our lives at every turn, accounting in part for the best and worst of human beings and for the best and worst in each of us."[1]

Since teachers can do little to influence the maturational patterns of students, except perhaps to accelerate or retard them to some degree, their most effectual area of endeavor always centers upon learning. Furthermore, because of man's unique traits and capacities, learning is far more crucial to him than to other members of the animal kingdom.

Whereas in the lower animals much behavior supposedly is instinctive, human children, benefiting from their high degree of plasticity, learn their many patterns of human behavior. The relatively long period of children's dependency upon adults, following their complete helplessness at birth, contributes to their acquisition of the culture of their group. Using their relatively high potential for intelligence and their capacity for communication through use of articulate speech and other symbols, members of each generation build upon the achievements—artifacts, ideas, customs, and traditions—of the generation before it. A culture—social heritage—of a society is the result of many generations of cumulative learning.

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[1] Ernest R. Hilgard and Donald G. Marquis, *Conditioning and Learning,* 2nd ed., Appleton-Century-Crofts, 1961, p. 10.

Man, however, does share with other mammals primary organic drives such as hunger, thirst, sex, cravings for oxygen, warmth, and rest, and possibly primary aversions such as fear and rage. The first expression of these drives and aversions is primarily a maturational process. But, in some way, human beings seem to transcend these hereditary drives and aversions. In large measure, this transcendence is centered in the human capacity to deal with a complex past, present, and future world so as to develop abstractions or generalizations which organize mazes of particulars into sensible patterns. Perhaps a desire to perceive, understand, imagine, and deal with ideas is just as much a part of human nature as are the specific organic drives and aversions. *Homo sapiens*—man—is a species of mammal characterized by its superior knowing and discerning abilities.

There apparently is no group of human beings that has not developed some devices for enriching its contacts with the world about it. People have attempted to derive satisfactions from understanding and manipulating the world as well as through merely touching, smelling, and tasting it. Contrasted with capacities of less advanced animals, man's potential for becoming human lies largely in his capacity for extension of experience to a world of symbolism.

Animals seem to derive satisfaction from using the abilities they have. Likewise man derives satisfaction from using his natural and acquired abilities. Thus, the very process of learning—both concrete and abstract—can become satisfying to man. In his social, aesthetic, economic, religious, and political life he shows a tendency to explore. Stated figuratively, man likes to "roll ideas around on his tongue" or "sniff at them" to discover what they will do. Not all people develop sophisticated ideological outlooks. However, rarely if ever are there groups of people who subsist solely on a vegetative level with no imaginative or mentalistic endeavors. Even the most primitive cultures have had some symbolistic folklore.

WHY THEORIES OF LEARNING?

Not only has man wanted to learn, but often his curiosity has impelled him to try to learn *how* he learns. Since ancient times, at least some members of every civilized society have developed, and to some degree tested, ideas about the nature of the learning process. Since the seventeenth century, more or less systematic theories of learning have emerged periodically to challenge existing theories. Typically, a new theory of learning is not translated into school practice until 25 to 75 years have elapsed. Then, as a new theory eventually comes to affect school policy, it usually does not displace its predecessors; it merely competes with them. Thus, as new theories have been introduced they have been added to the old and the educational scene has become more and more muddled. Probably most teachers, from time to time, have adopted conflicting features from a variety of learning theories without realizing that they are basically contradictory in nature and cannot harmonize with each other.

In most life situations learning is not much of a problem. A (lay) person takes it for granted that we learn from experience and lets it go at that; he sees nothing problematical about learning. Throughout human history people have learned, and in most cases without troubling themselves as to the nature of the process. Parents taught children and master workmen taught apprentices. Children and apprentices both learned, and those who taught felt little need for a grasp of learning theory. Teaching was done by telling and showing how, complimenting the learner when he did well, and scolding or punishing him when he did poorly. A teacher simply taught the way he had been taught when he was a youth.

When schools were developed as special environments to facilitate learning, teaching ceased to be so simple a matter. The subjects taught in school were different from the matters learned as part of routine life in a tribe or society. Mastering school subjects, whether the three R's, foreign languages, geometry, history, or something else, appeared to children as an entirely different sort of learning task from the tasks taken for granted in everyday life. Often their relevance to the problems of daily living seemed unclear. Such subjects, whose immediate usefulness is not obvious, strike a learner as quite different from the crafts and skills needed to carry on day-by-day social, economic, and political life.

Ever since education became formalized in schools, teachers have been aware that learning in school is often highly inefficient. Material to be learned may be presented to students innumerable times without noticeable results. Many students appear uninterested. Many become rebellious and make serious trouble for teachers. Consequently, classrooms often have seemed like battlegrounds in which teachers and students made war against each other.

Such a state may come to be taken for granted by teachers, students, and parents. They all may consider it "natural" that youngsters dislike school and try to resist school learning. They may assume that it simply is one of the unpleasant facts of life that many children will learn very little in school. From the colonial period through the nineteenth century, most people in America probably made these assumptions.

However, as soon as the professions of psychology and education developed, it was inevitable that professionals would begin asking questions. When teaching moved from mother's knee to a formalized environment designed to promote learning, it was inescapable that a small group of persons would arise to begin speculating about whether schools were getting the best possible results. Professional psychologists and educators, who were inclined to be critical of school practices, found that development of more or less systematic schools of thought in psychology offered a handy tool for crystallization of their thinking. Each of these schools of thought contained, explicitly or implicitly, a theory of learning. A given theory of learning implies a set of classroom practices. Hence, a theory of learning functions as an analytical tool; its exponents can use it to judge the quality of a particular classroom situation.

Psychology is not a field of study characterized by a body of theory which is internally consistent and accepted by all psychologists. Rather, it is an area of knowledge characterized by the presence of several "schools of thought." These may in some instances supplement one another, but at other times they are in open disagreement. Thus, we may find Psychologist X, who is both scholarly and sincere, opposed to many of the crucial ideas of Psychologist Y, who is equally scholarly and sincere. Such disagreement among psychologists may be disconcerting to students. But one of the challenges of psychological study lies in theoretical disagreement; only to the degree that a student is willing to think for himself can he emerge from his studies with something worthwhile. Some consolation may be had in the fact that similar disagreement exists in the physical sciences. One's gaining an understanding and appreciation of the achievements of thinkers in any area is never easy. As stated by Taube, "After all, if the fox twists and turns, so must the hound."[2]

What Is Learning Theory?

Quite often in our scientific age we erroneously think of *theory* as indefinite or indefensible conjecture which existed prior to the use of scientific method and evidence. Consequently, although we might not object to using the term in a description of the historical development of modern concepts of learning, we would expect the word "fact," rather than "theory," to be used in describing the current scene. After all, are we not now on solid enough ground for the term "theory" to be discarded? This, however, is not the case; theory definitely should not be abolished.

Any sharp distinction between theoretical and imaginative knowledge and action which stems from such knowledge is faulty. Action, whether a part of teaching or any other activity in life, either is linked with theory or it is blind and purposeless. Consequently, any purposeful action is governed by theory. Everyone who teaches or professes to teach has a theory of learning. A teacher may be able to describe his theory in explicit terms or he may not—in which case we can usually deduce from his actions the theory which he is not yet able to verbalize. The important question, then, is not whether a teacher has a theory of learning, but rather how tenable it is.

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[2] Mortimer Taube, *Computers and Common Sense,* Columbia University Press, 1961, p. 2.

Everything a teacher does is colored by the psychological theory he holds. Consequently, a teacher who does not make use of a systematic body of theory in his day-by-day decisions is behaving blindly. No long-range purpose or plan, no rationale, is observable in his teaching. A teacher without a strong theoretical orientation inescapably makes little more than busywork assignments. True, many teachers operate this way and use only a "bag of tricks" without theoretical orientation. However, this muddled kind of teaching undoubtedly is responsible for many of the adverse criticisms of public education which we hear today.

Unfortunately, some teachers who are theoretically oriented have never developed their psychology beyond the stage of folklore—traditional customs or beliefs. It may go no farther than beliefs such as "you can't change human nature," "people are instinctively religious," "there has never been a bad boy—only bad parents," and "spare the rod and spoil the child." Folklore though they be, these are all theoretical statements, and their acceptance calls for particular kinds of action. If, in each case, one should believe the opposite, an entirely different kind of action should follow.

A teacher need not base his thinking on folklore; he may be quite aware of the most important theories developed by professional psychologists, in which case his own psychological theory is likely to be quite sophisticated. The latter state of affairs is what professional psychologists interested in education of teachers are trying to induce. Teachers who are well grounded in scientific psychology—in contrast to "folklore psychology"—have a basis for making decisions which are much more likely to lead to effectual results in classrooms.

As a student, you may not have a large background either of practical experience or of "book knowledge" to bring to bear on the question of how children learn. Nevertheless, you do have some resources on which to draw, even before reading farther in this book. You have been learning all your life and are continuing to do so—let us hope. And all your life you have been associating with others who were also learning, often from you. What seems to be the essential nature of the process called learning? What happens within, or to, you when you learn? Does the same thing happen to everyone? It probably would be helpful to you, now, to take paper and pen and write a one- or two-page essay on this subject. (You may not find this an easy assignment!) Repeat the assignment when you have mastered this book and see the difference in your two essays.

This book deliberately presents several competing theories of learning which provide different answers to many of the questions which might be raised, so that students will become increasingly sophisticated about the "schools of thought" that exist in psychology today and understand how differently each attacks respective problems. The "comparative" treatment employed requires, among other things, that students do considerable thinking for themselves.

How Is Learning Theory Evaluated?

It is one thing to talk about independent thought and another actually to achieve it. Thinking for oneself is never easy. It may be easier for you to do a respectable job of independent thought if you are clearly aware of two competing kinds of criteria for judging the answers to questions: the *authoritarian* and the *scientific*. Think about any statement that you consider to be true. Do you regard it as true merely because you read it somewhere or heard some teacher or other "authority" say it or because, after you examined all the available pertinent evidence, it seemed to have more factual support than any alternative statement? If you accept the statement "on faith" because someone told it to you, you have used an authoritarian criterion for judging truth. If you accept it because you have pursued your own careful investigations of it or studied the investigations of others, you are operating within a more scientific framework.

Although we know the distinction between authoritarian and scientific approaches, the road still may not be smooth. In the first place, often we are required to reach conclusions before we have had time to conduct our own investigation or study critically the investigations made by those who pose as authorities. In such cases we have no choice except to take someone else's word for it. Whose word do we take? In answering questions in psychology, we might turn to the writings of the most prominent psychologists. Unfortunately, prominence does not guarantee reliability. Less well-known persons may be more nearly right. Furthermore, in the field of psychology it is common for top-ranking authorities, who have spent lifetimes in research, to disagree.

There are no final answers to questions concerning learning, and no theory can be found to be absolutely superior to all others. Nevertheless, a teacher can develop a learning theory of his own which, because of its internal harmony and educational adequacy, he can support. Such a theory may turn out to be something of a replica of one introduced in this book, or the reader may benefit by contributions of several theories and derive one of his own. In either event, the quality of his teaching will be enhanced for his having thought through the question of the nature of the learning process which he—a teacher—wants to promote in his students.

WHAT ARE SOME LEARNING THEORIES REFLECTED IN SCHOOL PRACTICE?

In this section we present an abbreviated sketch of the major lines along which learning theory has developed. In succeeding chapters we develop each of these lines of thought in considerable detail.

Learning theory is a distinct area within theoretical psychology. At present, most psychologists who are dedicated to a study of learning are concentrating upon developing systematic theories supported by experimentation. Experimental and theoretical literature on learning has grown to an almost forbidding mass. Ernest R. Hilgard is perhaps the ranking authority on comparative learning theory. Teachers should find it interesting to dip into Hilgard's book,[3] which treats in some detail eight learning theories which have currency in the United States. Hilgard discusses only those which are currently acceptable to a sizable number of professional psychologists. Still other theories of learning are assumed by certain groups of nonpsychologically trained professors and public school personnel.

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[3] Ernest R. Hilgard, *Theories of Learning,* Appleton-Century-Crofts, 1956.

In the ensuing chapters, we describe various learning theories now extant. All continue to be highly relevant to contemporary issues in education. *Mental discipline, natural unfoldment,* and *apperception* were developed prior to the twentieth century, but they continue to be highly influential.

Twentieth-century learning theories may be classified into two broad families, namely *S-R associationistic* and *Gestalt-field* families. Chapters 3 and 4 discuss the differences between these families. Then, Chapters 5 and 6 contain descriptions of two popular contemporary psychologies of learning which represent the S-R associationistic family—*operant conditioning and quantitative S-R theory*—and Chapters 7 and 8 are devoted to a contemporary representative of the Gestalt-field family—a *cognitive-field psychology of learning.*

Learning, as explained by S-R associationists, involves primarily the formation of mechanical connections of some sort between stimuli and responses. Everything a student does, whether it is thought or action, is explained in terms of responses following stimuli or stimuli following responses. Stimuli are features of the environment which act on an organism to cause it to respond. Responses are reactions of an organism to stimulation. The approach of S-R associationisms may be diagramed as in Figure 1.1.

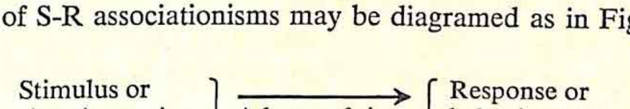
Stimulus or situation acting on an organism
A lapse of time
Response or behavior of the organism

FIGURE 1.1 *The Approach of S-R Associationism.*

Learning, to Gestalt-field theorists, is a process of gaining or changing insights, outlooks, or thought patterns. In thinking about the learning processes of students, these theorists prefer the terms *person* to *organism, psychological* to *physical* or *biological en-*

vironment, and *interaction* to *action* or *reaction.* Such preference is not merely a whim; there is a conviction that the concepts *person, psychological environment,* and *interaction* are highly advantageous for teachers in describing learning processes. They see a person, his environment, and his interaction with his environment all occurring at once; this is the meaning of *field.*

To summarize the difference between the families very briefly, S-R associationists interpret learning in terms of changes in strength of hypothetical variables called S-R connections, associations, habit strengths, or behavioral tendencies; and Gestalt-field theorists define it in terms of reorganization of perceptual or cognitive fields or systems. Whereas an S-R associationistic teacher desires to change the behaviors of his students in a significant way, a Gestalt-field oriented teacher aspires to help students change their understandings of significant problems and situations.

Through study of theories of learning and their historical development, teachers should gain insight into the harmonies and conflicts that prevail in present educational theory. Through this insight, they should move toward developing adequate theories of their own. Before attempting to formulate one's own learning theory, one would do well to examine carefully and critically the prevalent theories which have been developed by "experts." Furthermore, in order to understand the teaching climate of present-day schools, it is important to develop some comprehension of learning theories which have emerged in the past and still have prominent places in modern education, even though they are no longer among the theories advocated by present-day theoretical psychologists.

HOW MAY LEARNING THEORIES BE CATEGORIZED?

Table 1 is a categorization and summarization of the better-known theories of learning as they are related to *assumptions concerning the basic nature of man, psychological systems or outlooks,*[4]

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[4] See Benjamin B. Wolman, *Contemporary Theories and Systems in Psychology,* Harper & Row, 1960.

and bases of transfer. As students pursue study of learning and teaching, they should find it helpful to refer frequently to this table.

What Are Ten Possible Theories of Learning?

Since mental discipline is reflected in two quite different psychological outlooks—faculty psychology and classicism—entries 1 and 2 of Table 1 both are devoted to it. Chapter 2 is devoted to explanation and evaluation of the first four theories: mental discipline of two kinds, natural unfoldment, and apperception. Entries 5, 6, and 7—S-R bond, conditioning (with no reinforcement), and reinforcement and conditioning[5]—are encompassed by the more generalized concept, *S-R associationism*. The S-R associationisms are treated in parts of Chapters 3 and 4 and all of Chapters 5 and 6. Entries 8, 9, and 10—insight, goal insight, and cognitive-field theory—are *Gestalt-field theories*. These are explained in parts of Chapters 3 and 4 and all of Chapters 7 and 8.

The remaining part of this chapter, which follows the table of learning theories, explains briefly the meaning of the columns on Table 1 other than the first, and gives the reader some notion of where he may encounter treatment of their content in various sections of the book.

What May We Assume about the Basic, Innate Nature of Students?

Each theory of learning is linked to a conception of the basic nature of man. Consequently, when we consider how learning occurs, it is inevitable that we formulate some assumption about the basic nature of students. Hence, before we proceed very far in thinking about the nature of the learning process, we must consider the question of the basic nature of students as human beings.

Consideration of the basic nature of man would be quite simple were there but one answer. Unfortunately, but interestingly, there are several distinctly different and mutually opposed answers to

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[5] One group of S-R associationists, headed by Guthrie, emphasizes conditioning with no need for reinforcement; another group, represented by Spence and Skinner, thinks that learning includes both reinforcement and conditioning.

TABLE 1. Representative Theories of Learning

Theory of Learning	Assumption Concerning the Basic Nature of Man	Psychological System or Outlook
1. Mental discipline	bad-active (mind substance)	faculty psychology
2. Mental discipline	neutral-active (mind substance)	classicism
3. Natural unfoldment	good-active (natural)	romantic naturalism
4. Apperception	neutral-passive (mental)	structuralism
5. S-R bond	neutral-passive (physical or mental)	connectionism
6. Conditioning (with no reinforcement)	neutral-passive (physical)	behaviorism
7. Reinforcement and conditioning	neutral-passive (organism)	reinforcement
8. Insight	active (natural)	Gestalt psychology
9. Goal insight	neutral-interactive	configurationalism
10. Cognitive-field	neutral-interactive (psychological)	field psychology or relativism

this question, each enjoying a good deal of support. As students read this section, they should attempt to define their own positions in regard to this crucial problem. Is man naturally *evil?* Or is he naturally *good?* Or is his original, moral nature *neutral*—neither naturally good nor evil? Also, in relationship to his environment,

Basis of Transfer	Key Persons	Contemporary Exponents
exercised faculties, transfer automatic	St. Augustine John Calvin J. Edwards	many Hebraic-Christian fundamentalists
cultivated mind or intellect	Plato Aristotle	M. J. Adler St. John's College
recapitulation, no transfer	J. J. Rousseau F. Froebel	extreme progressivists
apperceptive mass	J. F. Herbart E. B. Titchener	many teachers and administrators
identical elements	E. L. Thorndike	J. M. Stephens A. I. Gates
conditioned responses	J. B. Watson	E. R. Guthrie
reinforced, or conditioned, responses	C. L. Hull	B. F. Skinner K. W. Spence
transposition of insights	M. Wertheimer K. Koffka	W. Köhler
tested insights	B. H. Bode	E. E. Bayles
continuity of life spaces, experience, or insights	Kurt Lewin E. C. Tolman J. S. Bruner	R. G. Barker A. W. Combs H. F. Wright

is man naturally *active?* Or is he naturally *reactive?* Or is naturally *interactive?*

To prevent confusion, we must state what we mean by "naturally." When we refer to a "natural characteristic" we mean a characteristic genetically inherited by *all* members of a species. We could substitute terms such as *original* or *innate*. The manner in which we use *man* also should be made clear. In this section it is used in a generic sense; it applies collectively to all members of the human race.

ALTERNATIVE ASSUMPTIONS CONCERNING BASIC MORAL NATURES. If we assume man is naturally evil, we can expect nothing good from him; his evilness will naturally unfold if left to itself; the person will show no traits other than bad ones. If we assume man is naturally good, then unless he is corrupted by some outside force, everything that comes from him will be good.

Neutrality in basic moral nature means that we assume that man by nature is neither good nor bad, but merely *potential* in a way that has no connection with innate badness or goodness.

ALTERNATIVE ASSUMPTIONS CONCERNING ENVIRONMENTAL RELATIONSHIPS. If children are basically *active,* their underlying characteristics are inborn—thus, psychological reality comes from within them. Environments merely serve as locations for their natural unfoldment. If they are basically *passive,* or *reactive,* their characteristics are largely a product of environmental influences.

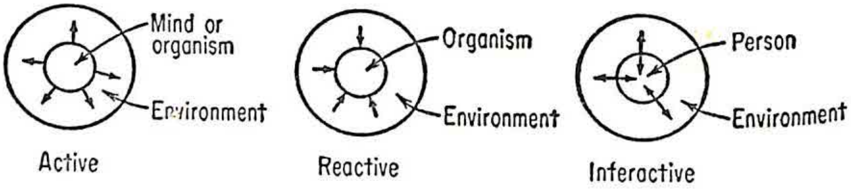

FIGURE 1.2 *Models of Mutually Opposed Assumptions in Regard to the Nature of Men and Their Environmental Relationships.*

Thus, reality is centered in environment. If they are *interactive,* their psychological characteristics result from their sizing up their physical and social environments; thus reality is person-environment centered; it consists of what one makes of what comes to one —that is, what one gains from experience. These three mutually opposed assumptions in regard to human beings and their environmental relationships are illustrated by three models in Figure 1.2.

ALTERNATIVE COMBINATIONS OF ASSUMED MORAL NATURES WITH ASSUMED ENVIRONMENTAL RELATIONSHIPS. When we consider the possible, feasible combinations of assumptions concerning man's basic moral nature with those concerning his relationship with his environment, we might reasonably assume students, by nature, to be either bad-active, good-active, neutral-active, neutral-passive, or neutral-interactive.[6] These assumptions are shown in the second column of Table 1, page 12.

Each of these assumptions in regard to the basic nature of students has definite implications for a theory of the learning process. If we assume students are either bad-active or neutral-active, we will adhere to some form of *mental discipline.* This learning theory is described in the early part of Chapter 2, pages 19–31. If we assume students are good-active, we will think of learning as natural unfoldment. This view is treated on pages 31–32.

An assumption of neutral-passivity may take one of several forms: apperception, S-R bond theory, conditioning, or reinforcement. Apperception theory occupies the last section of Chapter 2, pages 36–47. The latter three are forms of S-R association theory which is discussed in Chapters 3 and 4, pages 52–60 and 94–102.

Lastly, the assumption that students are neutral-interactive is the pivotal thesis of Gestalt-field theories described in Chapters 3 and 4, pages 61–64 and 102–108, and cognitive-field theory, treated in detail throughout Chapters 7 and 8.

Alternative Psychological Systems or Outlooks

A theory of learning not only reflects an assumption concerning the basic nature of man, it also represents a *psychological system or outlook* or, to say this in another way, each systematic psychological system or basic outlook has its unique approach to learning. The third column of Table 1 contains systematic psychologies or basic outlooks which reflect respective theories of learning. Systematic psychologies and outlooks appear, from place to place, throughout the book as we treat learning and related problems. These are the subject matter of a course in systematic psychology.[7]

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[6] For an expansion of these distinctions, see Morris L. Bigge and Maurice P. Hunt, *Psychological Foundations of Education,* Harper & Row, 1962, pp. 29–54 and 160–180.

Combination of innate goodness or badness with natural passivity or interactivity is not very feasible.

Theories of Transfer

Transfer, the subject of the fourth column of Table 1, means the relationship between a person's learning process and his using his learnings in future learning or life situations. Chapter 9 is devoted to treatment of this subject. This, of course, is the key to the value of learning which occurs in schools. Schools should attempt to teach students in such a way that they not only accumulate many significant learnings applicable to life's situations, but that they also develop a technique for acquiring new insights or understandings independently. These two goals of education constitute the realm of transfer.

By reading across each entry in Table 1, we can get a picture of ten different ways of looking at the problem of how students learn. For example, a person who embraces number (4)—apperception—assumes that students basically are of a *neutral-passive, mental* nature; he is committed to psychological *structuralism;* and his basis for transfer is the idea of *apperceptive mass.* Furthermore, the key historical person in development of this outlook was J. F. Herbart, and many teachers and administrators are, perhaps unknowingly, its contemporary exponents.

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[7] Two recent texts for such a course are Benjamin B. Wolman, *Contemporary Theories and Systems in Psychology,* Harper & Row, 1960, and J. P. Chaplin and T. S. Krawiec, *Systems and Theories of Psychology,* Holt, Rinehart and Winston, 1960.

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CHAPTER 2

What early theories of learning are reflected in current school practices?

THE PRESENT CHAPTER is devoted to three conceptions of the learning process which emerged prior to the twentieth century but continue to have great influence in today's schools: (1) *mental discipline,* (2) *natural unfoldment,* and (3) *apperception.* These three theories have one characteristic in common: all were developed as nonexperimental psychologies of learning. That is, their basic orientation is philosophical or speculative. Each may be identified with a particular philosophical system and a corresponding school of psychology. The method used to develop these three conceptions of learning was introspective and subjective; philosopher-psychologists who evolved these ideas tried to analyze their own thought processes and describe in general terms what they thought they found.

WHAT IS MENTAL DISCIPLINE?

According to the doctrine of mental discipline, education is a process of disciplining or training minds. Proponents of the doctrine believe that in this process mental faculties are strengthened through exercise. Just as exercising an arm develops the biceps, exercise of mental faculties makes them more powerful. Choice of learning materials is of some importance but always is secondary to the nature of minds which supposedly undergo the disciplinary process. Persons are thought to be composed of two kinds of basic substances or realities—mental and physical. That which is disciplined or trained is *mind substance.*

Mental discipline has roots which extend to antiquity. Its manifestations continue to be quite evident in present-day school practices. The theory was somewhat dormant during the first half of the twentieth century. However, the "Sputnik age" has led to its revival and revitalization.[1]

What Is Mind Substance?

Mental reality often is called mind substance and usually is assigned the dominant position in a mind-body dualism. The mind substance theory means that mind is just as real as anything physical. It has a nature of its own and operates in its own distinctive fashion. Physical substance—rocks, buildings, plants, and animals—is characterized by extension; it has length, breadth, thickness, and mass. Mind substance, on the other hand, is not extended; it has no length, no breadth, no thickness, and no mass, but it is as real as anything can be. In a sense, man is considered a mental and physical whole. However, body and mind supposedly are of such nature as to be mutually exclusive of one another; they have no common characteristic.

How did primitive man acquire the idea that he had a substantive mind? We do not know, but it is plausible to suppose that dreaming was partially responsible. Picture Warrior A and Warrior B lying down together after a hard day's hunting and a heavy feast. Warrior A has eaten too much and as a result is unable to sleep. Having been more moderate in his eating, Warrior B sleeps all night but his sleep includes an adventurous dream. Upon awakening in the morning, Warrior B relates the experience of finding and stalking game during the night. Warrior A expresses disbelief and insists that Warrior B has been on the ground beside him all night. But Warrior B is equally insistent that he spent the night hunting and describes his dream so convincingly that both men decide that there must be *two* Warrior B's. One slept on the ground throughout the night; the other must have come from within the first and carried on his escapades *unhampered by bodily form.* Thus could have been born something like a modern concept of mind substance.

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[1] See Walter B. Kolesnik, *Mental Discipline in Modern Education,* University of Wisconsin Press, 1958.

The mind substance concept has been with us so long and is so deeply embedded in present-day cultures that quite often it is assumed to be a self-evident truth. However, the concept of a mental substance with its own unique characteristics is one which man has developed gradually through the ages. It has grown through the experiences of primitive and early civilized man and has been handed down, often uncritically, from generation to generation. The familiar has come to appear self-evident.

A defensible mind substance theory must take mind out of space completely. As long as one attributes to mind some characteristics of matter, even though they are very thin and elusive, he implies that mind is of essentially the same nature as matter. Thus, in understanding a mind-substance theory of learning it is necessary to make a sharp distinction between mind and matter. We must remind ourselves that, if a mind is nonspatial, it cannot be located in the brain or anywhere else; and that, to date, man has devised no way of determining experimentally the way in which spatial and nonspatial entities influence one another.

If one adheres to a mind-substance theory, he must see all learning as a process of developing or training minds. Learning becomes a process of inner development within which various powers such as imagination, memory, will, and thought are cultivated. Education becomes a process of mental discipline.

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How Did the Mental Discipline Theory of Learning Develop?

Plato believed that mental training or discipline in mathematics and philosophy was the best preparation for participation in the conduct of public affairs. Once trained, by having his faculties developed, a philosopher-king was ready to solve problems of all kinds. Aristotle described at least five different faculties, the greatest and the one unique to man being that of reason. According to

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Aristotle, faculties which man had in common with lower animals were the vegetative, appetitive, sensory, and locomotive.

At the close of the Middle Ages, *Renaissance humanism* was an endeavor of man to gain more understanding of God, the universe, and himself. Humanism meant that man, rather than the Scriptures, was to be the starting point in satisfying man's urge toward individual development. To gain understanding of the ideal nature of man, humanistic scholars turned to the classics of ancient Greece and Rome. The resulting classicism of the Renaissance was developed on the assumption that a person's direction of growth is to be provided from within, not by yielding to the behest of every chance impulse, but by following principles which an individual himself formulates for guidance of his conduct. Thus, learning was regarded as a process of firm self-discipline; it consisted of harmonious development of all of one's inherent powers so that no one faculty was overdeveloped at the expense of the others.

Within humanism, the Socratic method was popular as a teaching procedure. A teacher's function was to help students recognize what already was in their minds. Environmental influence was considered of little consequence. "The Socratic method implies that the teacher has no knowledge, or at least professes to impart no information; instead, he seeks to draw the information from his students by means of skillfully directed questions. The method is predicated on the principle that knowledge is inborn but we cannot recall it without expert help."[2]

In the history of education, the nineteenth century could be characterized as the century of mental discipline. Rooted in European traditions of idealistic and rationalistic philosophy, the ideal of mental discipline had some currency in the early part of the century and it gained great popularity in the middle and later decades. A Yale faculty report of 1828 established mental discipline as the supreme aim of education. Study of the classics and mathematics was considered the best means of achieving it. A prominent English scholar, Matthew Arnold, wrote in 1867, "It is vital and formative knowledge to know the most powerful manifestations of the human spirit's activity, for the knowledge of them greatly feeds and quickens our own activity; and they are very imperfectly known without knowing ancient Greece and Rome."[3]

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[2] George F. Kneller, *Existentialism and Education*, Philosophical Library, 1958, p. 134.

Mental discipline placed little stress upon the acquisition of useful knowledge and information as such. Rather, it emphasized the training of mental faculties and the cultivation of intellectual powers apart from any specific application to practical problems. Since mental discipline was especially popular in liberal arts colleges, it was advocated for the college preparatory curriculums of academies and high schools.

REASSERTION OF CLASSICISM IN THE TWENTIETH CENTURY. Traditionally, humanists have been more interested in perfecting the minds of a few superior individuals than in elevating mankind as a whole, although this is not true today of all who call themselves humanists. Some twentieth-century humanists are attempting to repudiate the intellectual leadership of natural and social scientists in the affairs of life and to revert to the precepts of traditional philosophers as represented by Plato, Aristotle, and the medieval scholastics. These modern humanists believe we should make a sharp distinction between man and the world of nature. Man, being a rational animal, supposedly has certain unique universal and eternal qualities which separate him from the lower forms of nature. His education should center upon cultivation of his unique rational faculty. Some leading twentieth-century classical humanists are Robert M. Hutchins, Mortimer J. Adler, and Mark Van Doren.

AN EXAMPLE OF MENTAL DISCIPLINE. A brief history of the teaching of Latin and Greek illustrates development of mental discipline as a theory of learning. Throughout the Middle Ages, Latin served a practical purpose. It was the language of scholars throughout the Western world and the vehicle of instruction in schools. Thus it was a living, growing, changing language which today we would call a "tool subject." During the Renaissance, Latin continued to be the language of communication, and both Latin and

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[3] Matthew Arnold, *School Inquiry,* Vol. 6, 1867, p. 593.

Greek were used in reading the classics which contained those ideas considered the best that had been thought by man. To keep up with the thinking of his times, a scholar had to be able to read and use Latin and Greek.

After the Renaissance, modern languages gradually came into more general use. English, German, and French rose to prominence and assumed the role previously played by Latin and Greek. By the end of the sixteenth century, the communicative value of the classical languages was beginning to wane. Supporters of these languages, however, made a determined fight to preserve them. No longer needed for basic communication, Latin and Greek came to be heralded as the best subject matter for mental discipline. Throughout most of the nineteenth century the doctrine of the disciplinary value of these languages was generally accepted in American educational circles. Since, according to the classicists, disciplinary values are intangible and not susceptible to statistical treatment, evaluation of them supposedly was limited to analysis of opinions of recognized authorities on educational matters.

During the early years of the twentieth century when the mechanistic learning theories opposed to mental discipline—apperception, connectionism, and behaviorism—were on the upsurge in educational circles, Greek practically dropped out of the educational picture and Latin suffered a great decline.

However, by the middle of the twentieth century a resurgence of the classical tradition was apparent. With it came its earlier associate, mental discipline, and the teaching of Latin began to be expanded again. A mid-twentieth-century plea for a return to classicism and faculty psychology is expressed in a quotation from an article by Dr. Koerner, at one time Executive Secretary of the Council for Basic Education: ". . . many of us will persist in our notion that the most promising way we have yet found of preparing people to teach is to furnish their minds generously with the best that has been thought and said in the principal fields of man's intellectual activity; to allow them to gain a mastery of, and a delight in, at least one of these fields; to develop in them the power and the habit of thought; and in the process, to awaken their moral faculty and to discipline their will, that they may by example do the same for their students."[4]

What Forms May Mental Discipline Take?

The theory of mental discipline has at least two versions—*classicism* and *faculty psychology*.[5] Each is an outgrowth of different cultural traditions. Classicism stems from ancient Greece. It operated on the assumption that the mind of man is an active agent in relation to its environment and also that man is morally neutral at birth.

The psychology known as "faculty psychology" more often is associated with the bad-active principle of human nature than with the earlier Greek neutral-active principle. Because of differences in underlying assumptions concerning the basic nature of man, we find a difference between the kinds of education prescribed by classicists and by faculty psychologists. Let us examine this difference in more detail.

MENTAL DISCIPLINE WITHIN THE CLASSICAL TRADITION. Within the classical tradition a human mind is assumed to be of such nature that, with adequate cultivation, it can know the world as it really is. Man, being a rational animal, is free within limits to act as he chooses in the light of what he understands. Instead of being a creature of instinct, he enjoys a complex and delicate faculty of apprehension whose basic aspect is reason. This capacity resides in every normal human individual. It enables human beings to gain understanding of their needs and their environment, to direct their action in accordance with their understanding, and to communicate this understanding to other members of their group. Thus, it is assumed that the human mind is of such nature that, if it has been properly exercised and it has an opportunity, it will educe truth; it will develop outward manifestations of its innate potential.

Within the classicist frame of reference, knowledge assumes the character of a fixed body of true principles which are to be handed down as a heritage of the race. These principles have been discovered by the great thinkers of human history and have been set down in the great books. Hence, a classicist takes the basic content of the school curriculum from philosophical and literary classics. To him, not only training the mind, but also studying the eternal truths contained in certain "great" books is important.

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[4] James D. Koerner, "Merely Training in Pedagogy," *NEA Journal*, April, 1959, p. 18.

[5] See Table 1, pp. 12–13.

FACULTY PSYCHOLOGY. Although faculty psychology had been implicit in the classical tradition and in virtually every early scheme of education proposed, it did not appear as an explicit, formalized psychological doctrine until the eighteenth century. Christian Wolff (1679–1754), a German philosopher, is credited with its development. His version was described in his *Rational Psychology,* published in 1734. Wolff's thesis was that the mind, although unitary, has different faculties which are distinct. The mind at times enters into particular activities in much the same way that the whole body at different times takes part in widely different acts. According to Wolff, the basic general faculties are knowing, feeling, and willing. The knowing faculty is divided into several others, which include perception, imagination, memory, and pure reason. The reasoning faculty is the ability to draw distinctions and form judgments.

The belief in a willing faculty is an outgrowth of the notion that human nature may be described in terms of the bad-active principle. If human nature is intrinsically evil, then a strongly developed will is necessary to harness inherent evilness. Without will, a person would be unable to function in human society. Will, in the sense in which it is employed here, refers to ability to implement, or put into effective practice, a decision which has been made. A strongly developed will enables a person to "see a decision through" even though such action violates natural, i.e., evil, impulses. Hence, if one chooses to emancipate himself from his natural impulses, a well-developed will is necessary for success; he must make himself do that which he does not want to do. Faculty psychologists have held that if a person pursues any type of unpleasant work long enough his will is strengthened.

Under faculty psychology, the task of a teacher is to find the kind of mental exercises that will train the various faculties most efficiently. Emphasis is not on acquiring knowledge, but rather on strengthening faculties. A consistent faculty psychologist would not be especially interested in teaching "great truths" or the "heritage of the past" or any other type of subject matter except insofar as it is a good medium for exercising the faculties.

The special attention given by faculty psychology to development of the will has led to the notion that school work is better for a child if it is distasteful. When faculty psychology is a dominant influence in a school, teachers deliberately keep their assignments both difficult and dull and use force if necessary to insure that students complete them. Use of severe punishment, including ridicule and sometimes even whipping, is likely to be found in common use in such a school.

THE WEDDING OF CLASSICISM AND FACULTY PSYCHOLOGY. Faculty psychology, as developed by Wolff and his followers, was at first a challenge to classicism. Logically, faculty psychologists should consider one subject as good as another for exercising a particular faculty; also, knowledge retained by a student was considered much less important than the disciplining effect of learning it. But these conclusions negate the classicists' insistence on the virtues of certain subjects and on learning and retaining the great truths which human experience has unveiled.

However, a rather easy compromise soon became apparent. If it could be established that the best subjects for training the faculties were the classics, then the classical curriculum could be defended. This argument gained strength, and by the late nineteenth century most secondary schools and colleges offered a curriculum limited mainly to the classical liberal arts. These subjects were regarded as valuable for a twofold reason: they were excellent tools for mind training and they incorporated the great truths of human experience.

A curriculum based on traditional philosophy and the liberal arts may not seem very practical to most persons today. However, mental disciplinarians deliberately made a distinction between knowledge of immediate usefulness and practicality, and essential matters grounded in eternal standards of truth, goodness, and beauty. Mental disciplinarians are convinced that knowledge of immediate practical value is of little importance. They hold that only the abstract principles of "pure theory" can free the human mind and promote man's distinctively human capacity for reason.

This emphasis is understandable. Most adherents of mental discipline are mind-body dualists who feel that mind is much the more important member of the partnership. Identification of education with development of minds tends to disparage other aspects of human activity. Thus we are told that "Education, as a whole, can never be a 'science' in the strict sense of the term. It is part of the 'humanities.' "[6]

Scientific Attempts to Evaluate Mental Discipline

Mental discipline proponents generally have held that learning theory, curriculum construction, teaching methods, and educational practices cannot be evaluated scientifically; they are derived philosophically and hence can only be evaluated philosophically. However, by the early twentieth-century period an imposing array of psychologists and educators had become entranced by the potentiality of scientific processes, particularly objective and statistical procedures as exemplified in such fields as physics and chemistry.

Whereas on the one hand mental disciplinarians insisted that science could not be applied in such a human enterprise as education, on the other hand scientifically oriented educators and psychologists insisted that science could and must be used in education. Increasingly, scientific-minded persons came to view exponents of mental discipline as conservatives or reactionaries who opposed progress in education.

When the classical curriculum first took form, it represented the point of view of liberals of the time and reflected a desire for progress. Its adherents were sufficiently open-minded to permit changes. However, by the beginning of the twentieth century the classical curriculum had come under such sharp attack that its proponents were placed on the defensive. The more defensive they became, the more rigid and dogmatic their thinking seemed to be. They pleaded for a return to a rigid Renaissance ideal, forgetting that the Renaissance ideal itself was an example of change and growth.

[6] Robert Ulich, *Professional Education as a Humane Study*, Macmillan, 1956, pp. 112–113.

Almost to the end of the 1890s public high schools in the United States were loyal to the classical liberal tradition with its psychology of mental discipline. The famous Committee of Ten on Secondary School Studies upheld a doctrine of mental discipline throughout its 1890 report.

In the early 1900s Edward L. Thorndike (1879–1949) and Robert S. Woodworth (1869–1962), in a newer tradition of empirical psychology, performed experiments at Columbia University to test the validity of mental discipline as a psychology of learning. Their basic conclusion was that the idea of mental discipline is scientifically untenable. Their experiments showed that drill or training in performing certain tasks did not strengthen the so-called faculties for performing such tasks. Training in estimating the lengths of short lines resulted in no significant improvement in estimating the lengths of longer lines. Development of neatness in one area of activity showed no or very little improvement of students' neatness in other areas; students' arithmetic papers may be noticeably improved in neatness with no parallel improvement in neatness of language and spelling papers.[7]

Furthermore, Thorndike noted that the results of his experimentation, if corroborated by similar experiments, would prove that the amount of *general* improvement—mental discipline—due to any subject is small and that differences in improvement as a result of different subjects also are small. Thus the values of subjects must be decided largely by the special learnings which they provide. The languages (or any other liberal arts subjects) have no claims to pre-eminence. The order of influence, if any, of subjects upon growth of intellect was, first, arithmetic and bookkeeping; second, physical science; third, algebra and geometry; fourth, Latin and French; fifth, physical training; sixth, social science; seventh, history, music, shop, Spanish, English, drawing, and business; and eighth, dramatics, dramatic art, cooking, sewing, stenography, and biological sciences. Thus the so-called disciplinary subjects appear at all levels interwoven with supposedly nondisciplinary subjects. Thorndike reported in the *Journal of Educational Psychology:*

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[7] See Edward L. Thorndike and R. S. Woodworth, "The Influence of Improvement in One Mental Function Upon the Efficiency of Other Functions," *Psychological Review,* 1901, Vol. 8, May, pp. 247–261; July, pp. 384–395; November, pp. 553–564.

> If our inquiry had been carried out by a psychologist from Mars, who knew nothing of theories of mental discipline, and simply tried to answer the question, "What are the amounts of influence of sex, race, age, amounts of ability, and studies taken, upon the gain made during the year in power to think, or intellect, or whatever our stock intelligence tests measure?" he might even dismiss "studies taken" with the comment, "The differences are so small and the unreliabilities are relatively so large that this factor seems unimportant." The one causal factor which he would be sure was at work would be the intellect already existent. Those who have the most to begin with gain the most during the year. Whatever studies they take will seem to produce large gains in intellect.[8]

Thorndike was convinced that the principal reason that good thinkers seemed to have been made good thinkers by certain subjects which they had pursued is that good students tend to take the subjects which people generally identify with good thinking. Good students gain more than do poor students from the study of *any* subject. When good thinkers study Latin and Greek, these subjects seem to cultivate good thinking. However, "If the abler pupils should all study Physical Education and Dramatic Arts, these subjects would seem to make good thinkers."[9]

In 1914 Thorndike disposed of inborn faculties with two sentences: "[There is] the opinion that attention, memory, reasoning, choice and the like are mystical powers given to man as his birthright which weigh the dice in favor of thinking or doing one thing rather than another. . . . This opinion is vanishing from the world of expert thought and no more need to be said about it than that it is false and would be useless to human welfare if true."[10]

In 1944 Alexander Wesman made a study following up Thorndike's mental discipline studies. High school students were tested at the start and end of an academic year with a series of general intelligence and achievement tests. Gains on the tests during the year were observed for students taking differing course patterns to see whether some patterns of courses contributed more to intelligence than did others. Wesman's study revealed no superiority of any one school subject over any of the others studied; there was no superior addition to intelligence for any one of the achievement areas measured. Apparently no scientific basis exists for asserting that one high school subject contributes more to students' intelligence than does another.[11]

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[8] Edward L. Thorndike, "Mental Discipline in High School Studies," *Journal of Educational Psychology,* February, 1924, No. 2, p. 95.

[9] *Ibid.,* pp. 96–98.

[10] Edward L. Thorndike, *Educational Psychology,* Teachers College, Columbia University, 1914, p. 73.

WHAT IS LEARNING THROUGH UNFOLDMENT?

We come now to the second major position to be treated in this chapter, often called "learning through unfoldment." This outlook on the nature of learning stems logically from the theory that man is naturally good and at the same time active in relation to his environment. Early development of this point of view is usually associated with Jean J. Rousseau (1712–1778). Later, the Swiss educational reformer Heinrich Pestalozzi (1746–1827) and the German philosopher, educator, and founder of the kindergarten movement, Friedrich Froebel (1782–1852), used this outlook as a basis for their pedagogical thinking. The over-all philosophical framework of the natural-unfoldment position often is labeled *romantic naturalism*.[12]

Rousseau's position was that everything in nature is basically good. Since man's hereditary nature is good, it need only be permitted to develop in a natural environment free from corruption. Rousseau qualified his interpretation of human nature as an active, self-directing agent by conceding that a bad social environment could make bad human beings; to him social conditions are not natural. Thus, his rejection of environmentalism was not complete. However, his constant emphasis was on natural, active self-determination.

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[11] Alexander Wesman, "A Study of Transfer of Training from High School Subjects to Intelligence," *Teachers College Record*, October, 1944, pp. 391–393.

[12] See Table 1, pp. 12–13.

Rousseau urged teachers to permit students to live close to nature so that they might indulge freely in their natural impulses, instincts, and feelings. He emphasized that in rural areas children need practically no schooling or tutoring. An example which he gave related to the learning of speech. A country boy, he said, ordinarily did not need instruction in speech. He called to his parents and playmates from considerable distances and thus practiced making himself heard; consequently, without tutoring, he developed an adequate power of speech. It was only the city boy, growing up in close quarters with no opportunity to exercise his voice in a natural way, who had need for speech instruction. Thus, he recommended that in teaching city boys teachers should, insofar as possible, adopt the method through which country boys learn.

Since, according to the good-active definition of human nature, a child grows up unfolding that which nature has enfolded within him, devotees of this position tend to place great emphasis on the study of child growth and development and to minimize the study of learning. When they allude to learning, they seem to assume or imply that it, too, is little more than a process of growth and development.

Learning, in the usual sense of the term, generally is conceived as some form of imposition of ideas or standards upon a person or organism. Within romantic naturalism there is little need for this kind of learning. Instead, a child learns through the promptings of his own interests. There should be no coercion or prescription. A mind and its growth may be considered analogous to an egg in the process of hatching. Its growth is a natural operation which, without imposition from any outside source, carries its own momentum.

Since romantic naturalists depreciate the value of learning as such, they give a prominent place to the concept of needs. Needs are considered child-centered, as contrasted with environment- or situation-centered. As an organism or mind naturally unfolds through a series of stages, each stage is assumed to have its unique needs. Such child-centered needs have much in common with instincts; they supposedly are innate determining tendencies or permanent trends of human nature which underlie behavior from birth to death under all circumstances in all kinds of societies.

WHAT IS THE BACKGROUND OF APPERCEPTION?

The third major outlook toward learning which we describe—apperception—is far more complicated than faculty psychology or learning as unfoldment. Apperception is idea-centered. An idea is apperceived when it appears in consciousness and is assimilated to other conscious ideas. Thus, apperception is a process of associating new ideas with old ones.[13]

Adherents of both mental discipline and natural unfoldment assume or imply the existence of an inborn human nature, some aspects of which are common to all men. Although, in their treatment of learning, supporters of both theories sharply differ from one another, they agree that the "furniture of minds" is innate. Whereas romantic naturalists in their emphasis upon natural unfoldment expound instinctive natural development of persons, mental disciplinarians often agree that knowledge is inborn but insists that students need expert help to enable them to recall it.

Apperception, in contrast to both mental discipline and natural unfoldment, is a dynamic mental *associationism* based upon the fundamental premise that there are no innate ideas; everything a person knows comes to him from outside himself. This means that mind is wholly a matter of content—it is a compound of elemental impressions bound together by association, and it is formed when subject matter is presented from without and makes certain associations or connections with prior content.

What Is Associationist Psychology?

As explained in Chapter 1, scientific learning theories fall into two major categories: associationisms and field or cognitive theories. An *associationism* is any general theory within which it is assumed that learning starts with irreducible elements and the process of learning consists of combinations of these. We supposedly connect ideas or actions in memory or thought simply because they were connected in our early experience with them. To study human beings in a framework of associationism, the method must be analytic or reductionistic; learnings must be reduced to their component successive parts. Modern associationisms include apperception, S-R bond, conditioning, and reinforcement theories. Basic elements associated may be mental, physical, or a combination of both. Within apperception, the associated elements are mental and constitute the structure of minds.

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[13] See Table 1, pp. 12–13.

How Did Associationism Develop?

Plato and other ancient philosophers thought that learning really consisted of remembering ideas with which a learner had been familiar before his birth; it was development of innate ideas from within. His student Aristotle perpetuated Plato's mental disciplinary psychology of learning. However, in his psychology, he recognized a role of the senses. The senses performed a subordinate function; they "tipped off" the faculties of the mind.

The thinking underlying modern associationism goes back to Aristotle, who observed that recollection of an item of knowledge was facilitated by a person's associating that item or idea with another when he learned it. He maintained that three kinds of connections—associations—would aid or strengthen memory: contiguity of one idea with another, similarity of ideas, and contrast of ideas.[14] Contiguity means being together. If a child is told about Eskimos and igloos at the same time, future mention of "Eskimo" will help him recall "igloo." "A tiger is a big kitty" uses the principle of similarity. If a person learns that pleasure is the opposite of pain, mention of "pain" will aid him in thinking of "pleasure."

JOHN LOCKE—A SENSE EMPIRICIST. In the seventeenth century John Locke (1632–1704) challenged the whole notion of innate faculties or ideas and with it the conception of learning as development of innate potentialities or faculties. Locke observed that he could find no common human nature at all. Realizing that he could find no ideas common to all people in any one society or to people in different societies, he developed his *tabula rasa* theory of the human mind. *Tabula rasa*—blank tablet—means that there are no innate ideas. Locke was convinced that, not only was a mind empty at birth, but also any ideas which a person holds must have come to him originally through his senses.

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[14] John S. Brubacher, *A History of the Problems of Education*, McGraw-Hill, 1947, p. 143.

Locke's theory that all of a person's ideas must come to him through his senses is called *empiricism.* His empiricism was directly opposed to the earlier *rationalism* of Plato and Descartes. Whereas these two scholars considered *reason* the source of knowledge, Locke insisted that knowledge was derived from *sense experience.* In his view perception is synonymous with learning and is a product of experience. A mind is insulated from the world of objects. Thus, objects which are perceived are only ideas of objects.

For Locke, ideas were the units of a mind, and *associations* consisted of combinations of ideas. Ideas were either simple or complex. One of the operations of a mind was thought to be a compounding of complex ideas from simple ones. This notion of mental combination and analysis was a beginning of the "mental chemistry" which later characterized *apperception.*

To allow for associations within a mind, Locke recognized an "internal sense." He realized that, if a mind were only a passive receptacle of sense impressions (which basically he thought it to be), the impressions would accumulate in a disorderly manner. Consequently, he gave mind a means for dealing with passive impressions once they were in. To mind was attributed the ability to compare impressions, to generalize them, and to discriminate between them. This meant that it could associate ideas through contiguity, similarity, and contrast.

Locke's writings spearheaded a shift in the conception of education from mental discipline to habit formation. The *tabula rasa* theory implied that the original nature of man was neither good nor bad, nor active. Instead, it was morally neutral and psychologically passive. Thus, a mind was the product of life experiences. Locke's thinking opened the way for psychologists to place their emphasis upon environmental nurture rather than hereditary nature. In school, this meant that teachers were to be the architects and builders of minds of children. They were to develop a systematic instructional program centered in procedures which might be used to form proper habits in students. Teaching became a matter of training the senses as opposed to training the faculties.

Locke's work constituted a turning point in professional thinking about *learning*. Up to the seventeenth century, most psychological thinking consisted of restatements and reinterpretations of the psychology of antiquity—mental discipline. This trend continued into the seventeenth and eighteenth centuries, but alongside it, Locke, preceded by Hobbes and followed by Hartley and Herbart, spearheaded associationism—a new line of thought in regard to learning.

Whereas Locke and other early associationists had assumed that linkages or associations are passive in nature, Herbart's apperception theory replaced this passivity with *dynamic* ideas. However, we should remember that, in Herbart's *apperception,* ideas, not persons, are dynamic. Persons are *containers* within which laws of mental chemistry supposedly operate.

WHAT IS APPERCEPTION?

Johann Friedrich Herbart (1776–1841) developed the first modern systematic psychology of learning to harmonize with a *tabula rasa* theory of mind. Herbart was an eminent German philosopher and a skilled teacher. From 1809 to 1833 he succeeded Immanuel Kant in the world's most distinguished chair of philosophy, at Königsberg, Germany. His speculative thinking developed from his dealing with problems of education. To him, morality was the supreme objective of education; he wanted to make children good. Thus he developed a psychology to achieve this goal.

Herbart's influence on twentieth century American education has been great. Although his theory was developed early in the nineteenth century, it was not until the 1880s that four young Americans—Charles De Garmo, Frank McMurry, Charles A. McMurry, and Charles C. Van Liew—studied at the University of Jena and returned to the United States to spread Herbartian doctrine with religious fervor. "Like a tidal wave, interest in this elaborate system swept over American teachers and students of education during the nineties."[15]

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[15] Frederick Eby and C. F. Arrowood, *The Development of Modern Education,* Prentice-Hall, 1934, p. 786.

From the early years of the twentieth century to the time its tenets were seriously challenged by behaviorism and connectionism, Herbartianism dominated teacher education institutions of the United States. Thus, if one is to comprehend the psychological atmosphere of today's schools, it is essential that one understand the development, principles, and implications of the theory of apperception. Today, one seldom meets an avowed Hebartian; however, much of what takes place in our public schools carries with it the implicit assumption that neutral and passive minds of children are being filled. Although apperceptive teaching seldom is advocated systematically in teacher-education institutions, much actual teaching continues to follow a pattern in harmony with the theory of apperception.

Herbart perpetuated a mind-body dualism which was prevalent in his time. This was a psychophysical parallelism within which the psychic aspect—mind—played the major role, particularly in the learning process. Psychophysical parallelism is a theory of mind and body according to which, for every variation in conscious or mental process, there is a concomitant, parallel neurological or body process. Yet there is no causal relation between body and mind; a person's mind does not affect his body, nor his body his mind.

Through the use of *presentations, apperception,* and *apperceptive mass* Herbart expanded the concept of mind's neutral passivity into a systematic theory of learning and teaching. He thought minds had no innate natural faculties or talents whatsoever either for receiving or for producing ideas. In them lay not even remote dispositions toward perception, thought, willing, or action. He regarded minds as nothing more than battlegrounds and storehouses of ideas. Ideas, he thought, had an active quality. They could lead "a life of their own" in minds which were completely passive. A mind was an aggregate, not of faculties, but of ideas or mental states. Dewey described the apperceptionists' view of mind in this way: "The 'furniture' of the mind *is* the mind. Mind is wholly a matter of 'contents.' "[16]

In his metaphysics, Johann Herbart posited a unitary mind or soul for each person which is part of ultimate reality and consequently exists prior to experience. However, psychologically the concrete character of a mind, according to Herbart, consists of an arrangement of ideas which are very much like the electrons of modern physics—they make up the object which contains them. A mind is an aggregate or group of contents resulting from a person's having certain ideas presented to him.

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[16] John Dewey, *Democracy and Education,* Macmillan, 1922, p. 82.

Herbart's ambition was to build a science of human minds which would parallel the physical and biological sciences. He thought of psychology as "mental chemistry." Thus he felt that the chief role of psychology was to study the various blendings and amalgamations of ideas or mental states in minds. Discovery of the principles by which ideas combine and recombine like chemical elements was Herbart's object in psychological investigation.

Although Herbart felt that his psychology was scientific, probably most experimental psychologists today would not agree; he rejected experimentation and the use of physiological data, both of which have been cornerstones of twentieth-century behavioristic psychology. To him, observation and thought were the proper methods for psychological inquiry. Furthermore, the observation he had in mind was self-observation, or introspection. By looking into his own mind, Herbart thought that its "chemistry" could be observed and described. He felt it proper that a science like physics was experimental, but equally appropriate that psychology be metaphysical and introspective.

What Are Mental States?

Herbart used the German term *Vorstellungen* to name the mental elements which he deemed the constituent parts of a mind. *Vorstellungen* may be translated to mean presentations, mental states, ideas, concepts, or notions. *Presentations* is the English term most often used in connection with Herbartian thought. However, when apperception theory was brought to the United States and subjected to further development, the term *mental states* superseded *presentations*. In this country Herbartianism often has been called a "psychology of mental states."

According to Herbartian psychologists, a mental state is a nonspatial, mental reality which is experienced at firsthand. Mental states have three forms—sense impressions, images or copies of previous sense impressions, and affective element of pleasure and pain. Mental states furnish the only source of mental activity. Feeling and willing accompany them but are not their source or cause. Feeling and willing are derived, not original, states. A person's stock of mental states at any given time is his "apperceptive mass."

How Does Apperception Work?

Mind is an aggregate of mental states. Until a first presentation occurs, there is nothing whatever present in a mind; it is completely inert and passive. Mental states, the active structure of mind, become associated to produce experience. New things are learned only as they are related to what is already in an apperceptive mass. Addition of new presentations to the old produces various types of mental processes.

The particular combination of ideas which is predominant at any given time determines what will hold a person's attention at that time. Within Herbart's system of mental chemistry every presentation—mental state—has a quality which gives it an affinity for certain other presentations and an aversion for others; ideas either attract or repel one another. Whereas ideas of "book" and "school" would have an affinity and attract each other, ideas of "book" and "fishing rod" probably would have a repugnancy and repel each other.

A Herbartian regards a mind as a battleground of contending ideas. Each idea in the mind of a person has once been in the center of his consciousness and it strives to return. It seeks self-preservation. It tries to conserve itself and to enter into relations with other ideas. Having once held the center of consciousness and subsequently lost it, each presentation, like a deposed king, keeps trying to occupy the throne once again. Compatible ideas may operate as teams, helping each other to remain in a conscious mind. When two ideas are incompatible, however, one is likely to be submerged.

To Herbartians, all perception is *apperception;* it is a process of relating new ideas—presentations—to the store of old mental states. A mind is like an iceberg in that most of it is submerged below the level of consciousness. Memories stored in the subconscious enable one to interpret experience of the moment. Without a background of experience, any new sensation would mean almost nothing at all. In picturing a mind, Herbart introduced the idea of threshold of consciousness. Objects occupying consciousness are constantly changing. At any moment, several ideas may occupy the consciousness. One will be at the focus of attention, some will be sinking below the threshold, and others will be striving to rise into consciousness. In Figure 2.1, mental state (b) is at the center of consciousness; (a) and (c) are only slightly above the threshold and in the margin of consciousness.

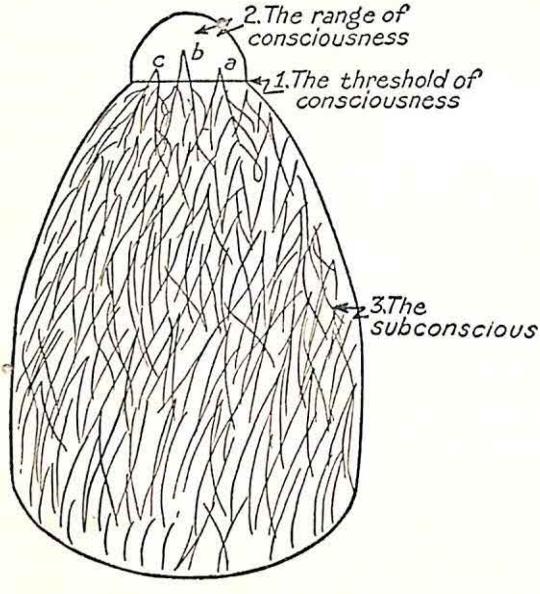
2. The range of consciousness
c
b
a
1. The threshold of consciousness
3. The subconscious

FIGURE 2.1 *Herbart's Scheme of Psychology. An adaptation from Frederick Eby,* The Development of Modern Education, *Prentice-Hall, 1952, p. 481.*

The subconscious aspect of mind contains the store of dynamic perceptions and images that have been accumulated during all past experiences of an individual. Any of these are ready to spring back into consciousness whenever a propitious opportunity occurs. The content of consciousness at any moment is the result of an interplay of many ideas. Apperception is a process not only of becoming consciously aware of an idea but also of assimilating it into a totality of conscious ideas.

Within the apperceptive process Herbart saw the principles of frequency and association in operation. The principle of frequency holds that the more often an idea or concept has been brought into consciousness, the easier becomes its return. The principle of association holds that, when a number of presentations or ideas associate or form a mass, the combined powers of the mass determine the ideas which will enter consciousness.

Herbart recognized three levels or stages of learning. First is the stage of predominately sense activity. This is followed by the stage of memory; this second stage is characterized by exact reproductions of previously formed ideas. The third and highest level is that of conceptual thinking, or understanding. Understanding occurs when the common, or shared, attributes of a series of ideas are seen. It involves generalization—deriving rules, principles, or laws from a study of specifics.

What Does Apperception Mean for Teaching?

According to apperception, right thinking will produce right action; volition or willing has its roots in thought. If a teacher builds up the right sequence of ideas, the right conduct follows. Hence, the real work of instruction is implantation not only of knowledge but also of inner discipline or will by means of presented ideas. Psychologically, students are made by the world of ideas which is presented to them from without.

Since, in apperception, there is no substantive mind to be developed, it could no longer be said that learning was a matter of developing or training a mind; rather learning has to do with the formation of an apperceptive mass. Thus the task of education is to cause present appropriate experiences to combine with a background. The problem of education is to select the right materials for forming the backgrounds or apperceptive masses of students. The concept of apperceptive mass implied that teachers must start with the experiences which pupils already have had and enlarge and enrich these experiences.

To Herbartians, the art of teaching consists of bringing to the attention of students those ideas which a teacher would like to have dominate their lives. Through controlling experiences of children, an instructor builds up masses of ideas which develop by assimilation of new ideas to them. Thus, by manipulating ideas he constructs a student's "circle of thought." The goal is a comprehensive circle of thought closely connected or integrated in all its parts. A teacher is the architect and builder of the minds, and hence the characters, of his students.

According to Herbart, at no time should a teacher enter into debate with his students on any matter. "Cases may arise when the impetuosity of the pupil challenges the teacher to a kind of combat. Rather than accept such a challenge, he will usually find it sufficient at first to reprove calmly, to look on quietly, to wait until fatigue sets in."[17]

What Are the Herbartian Five Steps in Learning?

Herbart and his followers have been convinced that the learning process proceeds through an ordered series of steps which a teacher should understand and follow. Effective teaching requires that, regardless of obstacles, the proper succession of steps be followed. Herbart's four steps, clearness, association, system, and method, were expanded to five by American Herbartians. Clearness became (1) preparation and (2) presentation; association became (3) comparison and abstraction; system became (4) generalization; and method became (5) application. Use of these steps came to be regarded as the general method to be followed in all teaching. The steps may be demonstrated by the following example, which involves teaching students the generalization that any object will float in liquid or in air if it weighs less than an equal volume of the air or liquid in which it is suspended.

1. *Preparation.* To bring into consciousness relevant ideas, the teacher reminds students of certain experiences they have had with

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[17] Johann Friedrich Herbart, *Outlines of Educational Doctrine,* Macmillan, 1904, p. 165.

floating objects. The students will recall the floating of boats, balloons, bubbles, and the like.

2. *Presentation.* The teacher presents new facts about floating, perhaps through means of demonstrations. For example, he might demonstrate how oil floats on water, or how a steel ball will float on mercury.

3. *Comparison and abstraction.* If the teacher has performed the first two steps properly, students will see that the new facts have similarities with those already known. Hence, in the students' consciousness, the new and old ideas associate. They are welded together because of their natural affinity for each other. Furthermore, students at this point should see the nature of the common elements which give the two sets of facts their mutual attractiveness. Sorting out this common element is what is meant by abstraction.

4. *Generalization.* In this step, students attempt to name the common elements of the two sets of facts as a principle or generalization. They arrive at the principle of flotation—the stated objective of instruction.

5. *Application.* The newly learned principle then is used to explain further facts or solve problems relating to flotation. This is done through assigned tasks or problems. The teacher might ask students to explain why boats can be made successfully from steel. Or he might give them a problem which requires them to determine whether a certain object would float in a certain medium. For example, he might ask, "Given a freight barge of specified weight and displacement, how much weight could be placed in it without causing it to sink?"

What Was the Herbartian Doctrine of Interest?

The importance of student interest held a prominent place in the theory of apperception. Present-day policy of "making subject matter interesting" probably has an important root in apperception. Whereas a follower of faculty psychology saw no point in interest—even saw it as a deterrent to developing will power—a Herbartian gave it a central place in his system.

Since, to a Herbartian, formation of mind was wholly a matter of presenting the proper educational materials, the task of a teacher was to select the proper subject matter and arrange its presentation on the basis of the current store of ideas in the student's mind. If the new material involved ideas with a natural affinity for those already present, the student would feel interest.

Interest meant "the natural bend or inclination of the mind to find satisfaction in a subject when it is properly presented."[18] Interest was an active power residing in the contents of the mind. It depended upon the nature of the apperceptive mass and determined what ideas were to receive attention. A person thinks, feels, and wills in accordance with his dominant presentations. To develop "many sidedness of interests" one must acquire a large apperceptive mass. Herbart listed six classes of interests under two major categories, those awakened by the phenomena of nature apart from man and those involving the direct study of human affairs. He then assumed a sort of affinity between the historical development of the race and the stages of mental development of children. He was convinced that the history and great literature of the world, when properly selected and arranged, would make a strong appeal to the interests and understanding of children at their successive periods of growth.

How May Apperception Be Evaluated?

Ideas developed by Herbartians continue to permeate today's schools. However, some of the terms used to express these ideas have been abandoned or redefined. Some key Herbartian terms were *interest, apperception, apperceptive mass, circle of thought, concentration, correlation, culture epochs, sympathy,* and *formal steps in instruction*. Aspects of these ideas can still be found in textbooks on curriculum and methodology.

Since it was the approach to teaching stressed most in a great many of our teacher education institutions from about 1900 to 1920, apperception remains influential even today. Large numbers of persons now teaching or holding administrative posts in schools received their first professional education in normal schools or teachers' colleges still strongly under the influence of Herbartianism. And many teachers of teachers are fundamentally Herbartian in their approach to educational problems.

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[18] Charles A. McMurry, *The Elements of General Method,* Macmillan, 1903, p. 85.

One area in which Herbartian influence is still frequently seen is that of lesson plans. In the Herbartian system, actual teaching was always preceded by construction of a formal lesson plan, built around the "five steps." Teachers followed these plans, more or less rigidly, on the assumption that the thinking of students could be made to conform to the formal steps. Today, many professors in teachers' colleges still insist that there is a fixed order of steps for teaching and learning. They require their students to write lesson plans in which the material to be taught is arranged according to these steps, and in supervising student teachers they insist that lesson plans be followed.

Why Has Herbartianism Ceased to Be a Moving Force in Education?

Even educators who are Herbartian generally no longer think of themselves as such. Herbartian psychology and the teaching to which it led fell under major criticism early in the present century. Its critics saw several flaws in it. One was the assumption about human nature which guided Herbart. The assumption of passive human nature implicit in Herbartian psychology leaves too much to be explained. Herbart recognized that people do think in an active fashion, but he refused to recognize any source or basis for active reflection. Ideas, not the person, carried the burden of thought. How ideas, or mental states, could be active and alive, carrying on a vigorous life of their own within a mind which was essentially passive, simply was not understandable to many people. Herbart's psychology and philosophy could be defended only in terms of the psychophysical parallelism which we mentioned earlier. This philosophical position, never very popular with philosophers, fell increasingly into disrepute.

More important perhaps than criticisms based on the abstruse features of Herbart's philosophy and psychology are criticisms of the teaching practices to which they led. Herbartianism seems to commit teachers to a program of indoctrination. Its approach to teaching requires teachers to determine precisely what their pupils are to be taught. Each lesson plan includes the answers as well as the questions. Students arrive at these answers through a largely mechanical process which is completely dominated by the teacher. Education is conceived as a process similar to filling a storage container. If learning is the mechanical process which Herbart and Herbartians described, how does reflective, creative thinking enter the educational scene?

Within Herbartianism, a teacher might teach for understanding, but not for reflection (see pages 315–325). In commenting upon Herbartianism, John Dewey felt constrained to say, "It takes . . . everything educational into account save its essence—vital energy seeking opportunity for effective exercise."[19] Since Herbartian theory at no time suggests that a child is interactive with his environment, inescapably, when applied in the classroom, it gives students little or no chance for active participation, including independent thinking.

A third criticism of Herbartianism is theoretical, but nevertheless vitally important. Explanations of the apperceptive process seem to have no adequate treatment of how the first ideas enter a mind so that apperception—perception upon perception—can take effect. How does the first idea tie up with an old one?

What Contributions Has Herbartianism Made to Education?

Modern Herbartianism has some weaknesses; nevertheless it has made important contributions to education. Greatest of all has been its attack upon the doctrine of mental discipline and faculty psychology. Further, it emphasized a psychological approach to teaching and learning, which implied a need for sound methods of teaching based upon knowledge of man and his mental functions. It directed attention to a need for adequate teachers and an enriched curriculum. Preparation of teachers was made an important business. It made "interest" a significant idea. It emphasized the importance of a background of experience in the process of perception.

Furthermore, Herbart, in developing a scientific if not experimental psychology, pointed the way for the later experimental scientific movement in psychology named *structuralism*. Structuralism was developed in the nineteenth century by Wundt in Germany and Titchener in the United States. Its subject matter was the content of consciousness. Consciousness, however, was studied by introspection. Structuralism was highly important in that it helped pave the way for modern psychologies which focus on mental processes and at the same time are experimental in the best scientific sense.

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[19] John Dewey, *op. cit.* (1916 ed.), p. 84.

Although apperception preceded behaviorism and connectionism on the psychological and educational scenes, a strong case may be made for its superiority over the later physicalistic psychologies that challenged it. Contemporary Gestalt-field theories, including cognitive-field theory, have deeper roots in Herbartian apperception than in behaviorism, reinforcement, or connectionism—the S-R associationisms. Pages 234–240 will help a reader evaluate the validity of this statement.

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CHAPTER 3

What are the two major families of contemporary learning theory?

THE TWO MOST prominent families of contemporary learning theory are *stimulus-response associationisms* and *Gestalt-field* theories. These have been in process of development throughout the twentieth century and have roots which extend back into earlier centuries. Their immediate forerunners were mental discipline and apperception. In a sense, both families were protests against inadequacies and inconsistencies of earlier psychological systems.

This chapter and the one to follow describe comparatively these two major families of psychological theory. This chapter develops "background thinking" which underpins the positions of the two families in regard to learning. It traces how they developed historically, their philosophical implications, and their chief assumptions about the role of psychology. It then shows how adherents of the two families differ in their interpretations of perceptive and motivational processes. Chapter 4 focuses specifically on the more technical aspects of learning theory associated with each family.

During the 1920s and 1930s, teachers' colleges moved away from Herbartianism as such. This is not to say that Herbartian ideas were completely dead. They were then, and are today, accepted and practiced by many teachers. However, before the twentieth century had been under way long, a new form of associationism had become popular. This was a nonmentalistic, or physiological, associationism.

Its chief exponents during the first third of the century were John B. Watson (1878–1958) and Edward L. Thorndike (1874–1949). Watson's psychology was known as behaviorism. Thorndike's was called connectionism, but it too, in the broadest sense of the term, was "behavioristic."

Although the psychological systems of Thorndike and Watson no longer are advocated in their original form, many contemporary psychologists have a sufficiently similar orientation properly to be termed "neobehaviorists."[1] Some leading contemporary neobehaviorists or S-R associationists are K. W. Spence (1907–), B. F. Skinner (1904–), E. R. Guthrie (1886–), J. M. Stephens (1901–), and A. I. Gates (1890–). If readers wish to refer to Table 1 (pp. 12–13), they will find that items 5, 6, and 7 refer to the S-R associationisms, and items 8, 9, and 10 to the Gestalt-field family.

The second major family of contemporary learning theories—Gestalt-field psychology—originated in Germany during the early part of the twentieth century. The four leaders in its development were Max Wertheimer (1880–1943), Wolfgang Köhler (1887–), Kurt Koffka (1886–1941), and Kurt Lewin (1890–1947). All four of these men migrated to the United States where they devoted their professional lives to development and refinement of their psychological position.

Gestalt-field psychologists consider learning phenomenon to be closely related to perception. Consequently, they define learning in terms of reorganization of the learner's perceptual or psychological world—his field. Some contemporary leaders whom we may identify with this family are R. G. Barker (1903–), E. E. Bayles (1897–), A. W. Combs (1912–), and H. F. Wright (1907–).

Gestalt is a German noun for which there is no English word equivalent, so the term was carried over into English psychological literature. The nearest English translation of *Gestalt* is "configuration." Various other persons who had been thinking along similar lines contributed to this new school of thought. As Gestalt psychology evolved, other names such as *field, phenomenological,* and *organismic psychology* became associated with it. Thus, we refer to related theories which originated from Gestalt psychology as Gestalt-field or configurational psychology. Gestalt-field psychology was introduced into the United States in the middle 1920s. It has gathered a large number of exponents and now can be considered the leading rival of S-R associationism. However, a great many psychologists are eclectic in the sense that they borrow elements from both schools of thought and identify themselves with neither.

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[1] *Neo* is a word element meaning "new," "recent," or "modified." When used as a prefix, it refers to a school of thought which is derived from an earlier school of thought but refined in various ways.

Students should be aware of the fact that within each of the two families of psychological theory there is considerable diversity. For example, in the S-R family, followers of K. W. Spence and B. F. Skinner would be in disagreement on many points. Likewise, in the Gestalt-field family, followers of Kurt Lewin differ considerably in outlook from followers of Kurt Koffka. The situation in psychology is somewhat like that in politics; many persons gravitate toward one or the other of our two political parties, but in spite of some common interests, both Democrats and Republicans exhibit a wide range of views. In the final analysis, however, S-R associationists have certain key ideas in common, just as do the Gestalt-field psychologists. It is proper to consider each category as a definite grouping which can be discussed in terms of the ideas common to its members.

If students are aware that in spite of variance within each family the two families differ sharply, they will understand the ensuing chapters on learning better. To fundamental issues in psychology the two families provide answers which are often quite incompatible. In dealing with the following questions, a person oriented toward S-R associationism is likely to give a significantly different answer from that given by a Gestalt-field theorist. What is intelligence? What happens when we remember and when we forget? What is perception? What is motivation? What is thinking? What is the role of practice in learning? How does learning transfer to other situations? These and many other questions are controversial in the sense that psychologists with different leanings will offer diverse answers.

Before a student adopts the orientation of one family of psychology or the other, he should recognize that objections may be made to any position one takes in psychology and to any currently available theory of learning. However, although the evidence is not clear enough to warrant dogmatic assertions about learning, one may emerge from a careful study with the feeling that the ideas central to one family of psychological theory are more tenable and have fewer disadvantages than the ideas central to the other.

Although all modern psychologists, irrespective of their orientation, generally accept the methods and results of experimentation, there is wide divergence in interpretation of experimental results and equally wide divergence on how a given interpretation should be applied in solution of a concrete learning problem. These differences appear to stem from disagreement over the fundamental nature of man, the relationship of man to his environment, and the nature of perception and motivation. In spite of disclaimers by some psychologists, it also appears impossible to detach a number of issues in psychology from related issues in philosophy. A psychologist's philosophical leaning may not only determine the kinds of experiments he conducts but also influence the conclusions he draws from experimentation.

WHAT ARE THE ORIGINS OF S-R ASSOCIATIONISM?

We observe in Chapter 2 that early associationists were interested primarily in mental phenomena; their concern was the association of ideas in minds. In contrast, modern associationism tends to be rooted in a different kind of interest—the physiology of bodies.

Nineteenth-century forerunners of modern experimental psychology tended to be philosophical dualists; they considered men to consist of minds and bodies, each genuinely real. There was a good deal of speculation in regard to the nature of the relationship of minds and bodies, but seldom denial of the reality of either. In the transition period between Herbart (1776–1841) and Watson (1878–1958), much vacillation took place between emphasis upon the workings of biological organisms and the functions of minds.

During the first half of the nineteenth century, experimental psychology got its start within experimental physiology. The physiologists Bell and Müller became occupied with testing the workings of the nervous system in seeing and hearing. Thus they became psychologists even though they did not call themselves such.

Wilhelm Wundt (1832–1920) was trained in medicine. He turned from medicine to physiology and from physiology to psychology. In 1879 he established the first psychological laboratory of modern history. His method was introspection; he and his students observed the workings of their respective minds. Students from various parts of the world went to Wundt's laboratory at Leipzig to study introspection. But many became psychological heretics; they turned to study of observable behavior of other persons and animals.

Interest in bodily functioning became apparent among many psychologists late in the nineteenth century. This group of "physiological psychologists" argued that psychology could become a true science only if it switched its focus to bodily processes. In a century which placed ever increasing emphasis upon experimental science, introspection came more and more to appear a highly unreliable procedure. A person could reflect upon the workings of his own mind, but what did this prove? Scientists were ceasing to be concerned with any kind of evidence which was not "publicly verifiable"—that is, subject to public observation and tests. Thus they began to focus their attention on objects or events which could be observed with the "five senses" and studied in the same manner by any number of trained investigators and lead to uniform conclusions.

To a growing number of psychologists, the only logical alternative to the method of introspection was to focus on observable forms of behavior. Such behavior includes not only bodily movement as seen by an observer watching a subject but also the internal physical processes related to overt bodily behavior. Why adrenalin is secreted and how long it takes a person to react to a pinprick are equally proper to a physiological psychologist. Both can be measured objectively, described in terms of definite mechanical sequences or quantities, and reported statistically. Before the twentieth century was very far along, a large number of psychologists had come to feel that psychology, in time, could be made as "scientific" as physics.

We shall name only a few of the persons who contributed to the development of physiological psychology. Marshall Hall (1790–1857) did pioneering work on the neural basis of reflex behavior. Pierre Flourens (1794–1867) demonstrated that different parts of the nervous system have different functions, and he took important steps toward identifying the function of each part. Flourens also proposed that conclusions drawn from animal experimentation should be equally applicable to man. This notion gained wide acceptance and greatly simplified the work of experimental psychologists: after all, it is much cheaper and more convenient to experiment with rats than with human beings.

Some of the most notable animal experiments of the late nineteenth and early twentieth centuries were conducted by the Russian physiologist Ivan Petrovich Pavlov (1849–1936). Pavlov put food before a hungry dog and sounded a bell or tuning fork. He found that, if this procedure was repeated enough times, the sound alone would cause the dog to salivate. As we shall see, Pavlov's work was extremely influential, and nowhere more so than among the growing group of S-R associationists in the United States. Thorndike's animal experiments, making use of chicks, dogs, and cats, were possibly even more comprehensive than Pavlov's and, over the long run, more influential in the United States. His famous "laws of learning" were derived mainly from his interpretation of how cats behave when placed in a cage from which they do not know how to escape—until they learn. Since Thorndike was a dominant figure in psychology for almost half a century, we describe some of his ideas in detail.

Thorndike's Connectionism

Thorndike was an eclectic in the sense that he retained in his thinking certain elements of Herbartian "idea associationism," and at the same time, he was strongly influenced by the new physiological psychology. Consequently, he assumed that there are both physical and mental events or units, and that learning is a process of linking the two in various combinations. A mental unit was something sensed or perceived; a physical unit was a stimulus or a response. Specifically, he saw learning as a process of connecting a mental with a physical unit, a physical with a mental unit, a mental with a mental unit, or a physical with a physical unit.

Thorndike's theory of learning is called S-R bond theory or *connectionism*. It assumes that, through conditioning, specific responses come to be linked with specific stimuli. These links, bonds, or connections are products of a biological change in a nervous system. Thorndike thought that the chief way in which S-R connections were formed was through random trial and error (or selecting and connecting). It is probably because of Thorndike's influence that the term trial-and-error became popularized and found its way into the vocabularies of many Americans.

In a typical trial-and-error experiment, Thorndike would place a cat in a cage which could be opened from inside only by striking a latch or button. The cat would claw, bite, and scurry wildly about until it accidentally touched the release and was freed. The experiment would be repeated and the animal would behave the same except that over the course of a number of successive "trials" the total time required by the cat to get out would decrease. Eventually the cat would learn to escape immediately without random activity. Thorndike inferred from the timed behavior of his cats that learning was a process of "stamping in" connections in the nervous system and had nothing to do with insight or "catching on."

Thorndike formulated a number of laws of learning and classified them as either primary or secondary. We describe here only his three primary laws:

1. *The law of exercise or repetition.* According to this law, the more times a stimulus-induced response is repeated, the longer it will be retained. As Thorndike put it, "Other things being equal, *exercise strengthens the bond between situation and response.*"[2] Conversely, a bond is weakened through failure to exercise it.

2. *The law of effect.* The law of effect states the famous pleasure-pain principle so frequently associated with Thorndike's name.

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[2] Edward L. Thorndike, *Education,* Macmillan, 1912, p. 95 (italics in original).

A response is strengthened if it is followed by pleasure and weakened if followed by displeasure. In Thorndike's words, ". . . [to] a modifiable connection being made . . . between an S and an R and being accompanied or followed by a satisfying state of affairs man responds, other things being equal, by an increase in the strength of that connection. To a connection similar, save that an *annoying* state of affairs goes with or follows it, man responds, other things being equal, by a decrease in the strength of the connection."[3]

3. *The law of readiness.* Thorndike termed the neuron (or neurons) and the synapse (or synapses) involved in establishment of a specific bond or connection a *conduction unit.* He assumed that, because of the structure of a nervous system, in a given situation certain conduction units are more predisposed to conduct than others. And *"for a conduction unit ready to conduct to do is satisfying,* and *for it not to do so is annoying."*[4]

In his later writings Thorndike disavowed his law of exercise or repetition and one-half—the annoyance aspect—of his law of effect. But he seemed not to have had the courage of his convictions. Through implication, he continued to emphasize repetition in learning. His law of effect shifted its emphasis to pleasure, but the pain aspect was not completely discarded.

Students will readily see that Thorndike's laws of learning are closely related and may operate together. For example, if an organism is ready to respond, then response is pleasurable and this fact in itself will tend to fix the response. Students will also see that the laws appear to be exceedingly mechanical. Furthermore, they seem to leave no room for any sort of thought or insight, and they do not appear to require the assumption of any kind of purposiveness of man or lower animals.

The psychological concept *purposiveness* has no direct relationship to the problem of cosmic or teleological purpose. Within a purposive psychology, as contrasted with a mechanistic one, we assume that each animal or person, whatever his developmental level, is seeking some end or purpose and that we can predict his behavior most accurately when we anticipate what it is he is trying to accomplish.

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[3] Edward L. Thorndike, *Educational Psychology,* Teachers College, Columbia University, 1913, Vol. 1, p. 172 (italics in original).

[4] *Ibid.,* p. 127 (italics in original).

Watson's Behaviorism

Watson felt much more strongly than Thorndike the need to base psychology exclusively on the concepts of physics and chemistry. To his way of thinking, mind and all kinds of mentalistic concepts were not only unsusceptible of scientific inquiry but also irrelevant to the real task of psychology. Watson drew heavily upon Pavlov's work and became convinced that learning was as Pavlov described it, namely, a process of building conditioned reflexes through the substitution of one stimulus for another.

Watson and other "pure behaviorists" came to reject certain of Thorndike's ideas because it seemed impossible to exclude mind and mind-related concepts from them. We have already mentioned that Thorndike talked of "mental units." The pure behaviorists were also bothered by Thorndike's concepts of satisfaction and annoyance. These seemed to behaviorists to be mentalistic concepts and better disregarded in a truly scientific psychology. In the tradition of the earlier physiological psychologists, Watson confined his study to only those aspects of animal life which are sufficiently overt to make possible highly objective observation and measurement.

One of Thorndike's secondary laws of learning, however, seemed very promising to the Watsonians. This was the "law of associative shifting," and it became the keystone for the behavioristic movement of the 1920s.

According to this law, we may "*get any response of which a learner is capable* associated with *any situation to which he is sensitive.*"[5] In other words, any response which is possible can be linked with any stimulus. An animal's "purposes or thoughts" have nothing to do with such learning. In fact, purpose and mentalistic thought supposedly are concepts outside the realm of scientific psychology. We may illustrate this law by using an example involving the training of an animal. Suppose we wish to train a dog to sit up at the verbal command "Sit." It is only necessary to induce the dog to sit up repeatedly by dangling a piece of meat or other food above him at the same time the verbal command is issued. Once this procedure has been repeated enough times, the dog should respond properly—without error—whenever the command is given. In this example, as long as the same "adequate stimulus" is used throughout the experiment, it would not matter if the command were replaced by any other accompanying stimulus to which a dog is sensitive—a light, a bell, snapping the fingers, whistling. Furthermore, by using the same basic procedure, it should be possible to teach a dog to perform any other act of which it is capable—standing on its front legs, rolling over, playing dead, etc. This supposed principle of learning, fundamental to behaviorism, is the principle of stimulus substitution.

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[5] *Ibid.*, p. 15 (italics in original).

Behaviorists defined a living organism as a self-maintaining mechanism. They assumed that the essence of a human machine is a system of receptors (sense organs), conductors (neurons), switching organs (brain and spinal cord), and effectors (muscles) attached to levers (bones)—plus, of course, fueling and controlling organs such as stomach and glands. When an organism is defined in such mechanistic terms, mentalistic concepts can be entirely eliminated. Not only can they be dropped out of the picture but they actually begin to seem rather fanciful. (Can one imagine a machine having "tender sentiments" or "soaring on the imagination"?) Among behaviorists, there developed an attitude toward the earlier mentalistic psychologists similar to that of a modern physician toward a primitive witch doctor.

The position of a Watsonian behaviorist can be illustrated amusingly in a morning conversation. Ordinarily, a conventional greeting would go as follows: "Good morning, how are you?" "I'm fine, and yourself?" "Just fine." But such a greeting implies introspection. Each person is "looking into himself" in order to decide what kind of shape he is in. Presumably (according to a behaviorist) this is scientifically impossible; instead the two persons would need to inspect each other. The proper salutation of a behaviorist would be, "Good morning, you appear to be fine; how am I?"

The Neobehaviorists

There is a large group of American psychologists today who assume that life can be explained in essentially mechanistic terms but who have adopted positions somewhat different from that of the Watsonian behaviorists. It might be said that Watsonian behaviorism, in its pure form, is all but dead. Probably the best term to apply to contemporary S-R associationists is *neobehaviorists.*

Contemporary S-R associationists do not place nearly as much emphasis upon the operation of brain and nervous system as did their predecessors. Of course, Watson himself had felt that the precise nature of neural mechanisms was largely irrelevant to learning; but Watson's followers, as well as Thorndike, had exhibited a strong interest in neural physiology and the physical mechanics of S-R linkages. Interests of neobehaviorists lie in analyses of behavior per se rather than in the neural mechanism behind it. They are still concerned with how S's and R's become linked, but they are not greatly concerned with the precise operation of the physiological mechanism which lies between the S's and R's.

Neobehaviorists differ from the original behaviorists in another respect. In their experimentation, they have tended to focus attention upon response modification as well as stimulus substitution. Response modification refers to the fate of responses that are made—whether they will be strengthened, weakened or changed by subsequent events. In this connection, continual reference is made in the literature of neobehaviorism to *conditioning*. Conditioning means changing a response habit. It is achieved by stimulus substitution—accompanying an adequate stimulus by a new stimulus—or by response strengthening or modification—following a response with a stimulus which strengthens or changes it. The two kinds of conditioning are explained in Chapter 4.

Since Thorndike's concept of learning as a process of "stamping in" a response which was originally accidental is a form of response modification, one might say that many neobehaviorists have returned to Thorndike's conception of learning. However, most neobehaviorists are better systematizers than Thorndike. This is, they are more consistent, largely by virtue of their building systems, which do not at any point require an assumption of conscious behavior. Thorndike tried to be highly mechanical, but the neobehaviorists have developed psychological theories which are more consistently mechanical than Thorndike's.

Another feature of neobehaviorism is its attempt to explain behavior which appears purposive. Purposiveness has always bothered psychologists who are behavioristically oriented because they have felt that purpose is difficult to explain without slipping into a mind-body dualism. However, what seems purposive must be explained in some way. Neobehaviorists tend to develop mechanical explanations for apparent purposiveness. Purposiveness is regarded as a product of a pattern of stimulation, in which certain stimuli are more potent than the rest and thus lead an organism in one way rather than another. Much purposiveness would be interpreted as "drive reduction," that is, a relieving reaction to the stimulation induced by organic drives such as hunger or sex. Neobehaviorists remain careful to explain apparent purposiveness in a way which does not require the assumption of conscious behavior or intelligent experience.

We shall mention but one more difference between the contemporary neobehaviorists and old-line pure behaviorists. Historically, behaviorism was "atomistic" in the sense that it focused on the "elements" of a situation. Attempts were made to identify specific stimuli and to describe the behavior of an organism as a product of numerous discrete and isolable reactions. Today, S-R theorists are more likely to talk in terms of "stimulus situations," complex configurations of stimulation, and "molar behavior"—the coordinated behavior of a whole act of an organism.

Well-known contemporary neobehaviorists and their followers are greatly interested in the psychology of learning. However, at one extreme Spence feels that in its present stage of development psychology has little to offer schools, and at the other extreme Skinner represents his psychology as the means of immediately placing education on an efficient basis.[6] In order to give the reader an understanding and appreciation of both of these S-R associationistic psychologies, Chapter 5 is devoted to an exposition of a Skinnerian and Chapter 6 a Spencian psychology of learning.

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[6] See Donald K. Adams *et al.*, *Learning Theory, Personality Theory and Clinical Research*, Wiley, 1954, p. 2.

WHAT ARE THE ORIGINS OF GESTALT-FIELD PSYCHOLOGY?

The position of Gestalt psychology was formally stated first by the German philosopher-psychologist Max Wertheimer in 1912. The central idea of Wertheimer's point of view is expressed in the German word *Gestalt,* which, as we have seen, means an organized pattern or configuration, or, more simply, an organized whole in contrast to a collection of parts. The notion that a thing cannot be understood by study of its constituent parts, but only by study of it as a totality, is probably very old. Gardner Murphy suggests that it can be found in the literature of pre-Socratic Greece.[7] Various Greek writers proposed that the universe could best be understood through "laws of arrangement" or "principles of order," rather than through study of its basic building blocks, the elements. In contrast, other Greek writers were "atomists," who sought the key to understanding through a study of individual elements. Just as the former might be called the originators of the Gestalt idea, so might the latter be called the originators of the atomistic idea—which characterized early behaviorism.

Among the nineteenth-century forerunners of Wertheimer we should include Ernst Mach (1838–1916), likewise a German. Although Mach held that the worlds of physics and psychology are essentially the same, he also argued that psychology must take into account those sensations which do not correspond to the physical reality before the viewer. These "nonphysical" sensations are sensations of *relationship*. For example, a person may see three dots on a sheet of paper and think of them as the points of a triangle. There is nothing in individual dotes to suggest this; it is their configuration that prompts the relationship.

In the 1890s, following Mach, Christian von Ehrenfels (1859–1932) pursued the same ideas. He stated that, in all perception, qualities appear which represent more than the physical items sensed. A perceiver tends to confer on the physical objects of perception a form, configuration, or meaning. He tries to organize or integrate what he sees. A school of thought began to form along the lines explored by these two men, and a new term came into use—*Gestaltqualitat,* which means approximately "the quality conferred by a pattern."

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[7] Gardner Murphy, *Historical Introduction to Modern Psychology,* Harcourt, Brace & World, 1949, p. 284.

Wertheimer and his followers went still farther and formulated a series of "laws" of perception—*Prägnanz, similarity, proximity, closure, good continuation,* and *membership character.* According to the basic law of *Prägnanz,* if a perceptual field is disorganized when a person first experiences it, he imposes order on the field in a predictable way. The "predictable way" follows the other five subordinate laws. *Similarity* means that similar items (dots, for instance) tend to form groups in perception. *Proximity* means that perceptual groups are favored according to the nearness of their respective parts.

Closure means that closed areas are more stable than unclosed ones. Draw a 340° arc and ask a viewer what you have drawn. He very likely will say "a circle." This is an example of closure; to achieve closure is satisfying. Closure is an alternative to Thorndike's law of effect. *Good continuation* is closely related to closure. It means that, in perception, one tends to continue straight lines as straight lines and curves as curves.

According to the law of *membership character,* a single part of a whole does not have fixed characteristics; it gets its characteristics from the context in which it appears. As Gardner Murphy puts it, "The Gestaltist insists that the attributes or aspects of the component parts, insofar as they can be defined, are defined by their relations to the system as a whole in which they are functioning."[8] For example, a patch of color in a painting derives its quality from its context—the surrounding picture pattern—rather than from anything inherent in itself.

In perception, organization of a field tends to be as simple and clear as the given conditions allow. A viewer imposes an organization characterized by stability, simplicity, regularity, and symmetry. He groups individual items in a field so they will have pattern. He relates similar items required for completeness, and if present patterns are meaningful he tries to maintain them into the future. Imposing a "good" Gestalt, as happens when the foregoing events occur, is a *psychological* task. It does not necessarily involve any change in the physical environment. Rather, it represents a change in how a viewer "sees" his physical environment.

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[8] *Ibid.,* p. 288.

Two of Wertheimer's German followers, Wolfgang Köhler and Kurt Koffka were mainly responsible for publicizing Gestalt psychology and establishing it in the United States. Köhler is famous, among other things, for his celebrated study of the learning process in chimpanzees (*The Mentality of Apes,* 1925). He set out to test Thorndike's hypothesis that learning is a matter of trial and error in which correct responses are gradually stamped in. Köhler observed that, in addition to learning which might appear accidental, his apes displayed a type of learning which appeared insightful. Hence, Köhler concluded that Thorndike's laws of learning were inadequate. Koffka's book *Growth of the Mind* (1924) contained a detailed criticism of trial-and-error learning as conceived by Thorndike. Koffka not only criticized Thorndike; his book also was a critique of the major ideas of behaviorism.

Kurt Lewin, also German-born, took the spirit of Gestalt theory, added to it some new concepts, and coined a new terminology. He developed a field psychology usually referred to as topological and vector psychology (deriving these terms from the fields of geometry and mechanics). Lewin spent his later years in the United States, where he acquired a considerable following. Because his psychology appears to be the most advanced and systematic field psychology, Chapter 7 and 8 are devoted to its expansion and refinement, especially with reference to learning theory.

As a result of experimentation by the Gestalt-field psychologists, S-R associationists generally are coming to recognize that the earlier atomistic stimulus-response idea, based as it was on the principle of simple reflex arcs, does not explain human behavior adequately. As previously indicated, there is a tendency among contemporary S-R theorists to speak of "molar behavior" or behavior of the whole organism in contrast to piecemeal or "molecular" behavior. Such psychologists characteristically refer to "total responses to patterns of stimulation." However, because these psychologists continue to think in terms of a mechanical linking of stimuli and responses, they are still within the basic pattern of S-R associationism. In spite of their adoption of the concept of molar behavior, their point of view tends to be fundamentally different from that of Gestalt-field psychologists.

WHAT IS THE PHILOSOPHICAL THINKING BEHIND THE TWO FAMILIES?

It is the purpose of this part of the chapter to explore some of the philosophical implications of the two families of psychology. When a contrast is drawn between their underlying philosophical premises, differences between the two families are made much clearer. Although psychologists have tried during the past century to divorce psychology and philosophy, it is doubtful that this is possible. There is no science so "pure" that it lacks philosophical implications. Even physicists find it helpful to make assumptions about the basic nature of their materials and processes; they too become involved in philosophical formulations.

Since any psychological system rests upon a particular conception of human nature, psychology is deeply involved with philosophy from the very start. The issue among contemporary psychologists is whether man is an active creature of instincts (as exemplified in Freudian or neo-Freudian psychology), an essentially passive creature in a determining environment (as implied in S-R associationism), or a purposive person interacting with a psychological environment (as implied in Gestalt-field psychology). Each of the two latter positions harmonizes with an allied philosophical outlook: S-R associationism with philosophic *realism* or *positivism*,[9] and Gestalt-field theory with a systematic *relativism,* also called *pragmatism, experimentalism,* or *instrumentalism.*

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[9] *Realism* as used here connotes the qualities of naturalistic, monistic realism; it is synonymous with positivism. Although its description also fits some facets of contemporary classical realism, it does not represent adequately that point of view.

Realism and S-R Associationism

What is realism? Space permits only the barest treatment. Realists are convinced that the physical world experienced by human beings is real and essentially what it appears to be when observed through the senses. Furthermore, even if there were no human beings around to observe it, it would exist in the same state. Existence is independent of a thing's being known. Realists assume that the physical world is governed by natural laws which operate inexorably and without change. They further assume that a basic principle of the universe is cause and effect; every event is determined by events that have gone before. Thus, the universe is a vast mechanism governed by laws which are essentially mechanical in nature.

Realists, especially those who identify themselves as positivists, think that we should abandon dogmatic, other-worldly, supernaturalistic, and tender-minded ways of thinking and replace them with critical, worldly, naturalistic, and empirical fact-minded outlooks and procedures.

A realist is likely to assume that there is a kind of hierarchy of the sciences, some being much more objective and reliable than others. He places at the top of the hierarchy physics and chemistry, aided by mathematics. These sciences are regarded as models, which other sciences should emulate. To a consistent realist, nothing should be asserted to be real or meaningful unless, through observation, it can be subjected to objective study, using only publicly verifiable data. If anything exists, it supposedly exists in some amount; if it exists in some amount, it can be measured.

Let us next see how this over-all point of view was transplanted to psychology. Early in human history, people commonly believed in animism, that is, that all objects, including even rocks, have minds or spirits. Since primitive man had no other way of explaining most types of natural events, animism provided at least some basis for understanding. As people learned more about natural causation, animism declined in popularity. In other words, when human beings came to understand something about gravity, a person no longer needed to attribute a mind and will to a rock to know why it fell on his head.

As time went on, mechanical explanations began to be applied to all sorts of physical events involving nonliving objects. Increasingly the nonliving parts of the universe were believed to consist of atoms in motion, each inert by itself, but subject to the push and pull of lawful forces external to itself.

Living matter, particularly human beings, did not appear to conform to the mechanical concepts applied in the world of nature. Human beings seemed, on the surface at least, to be willful and unpredictable. Thus some kind of mind force was attributed to them. Some persons assumed that all living things have such a nonmaterial life force; this is vitalism. Belief in a nonmaterial mind force as applied to human beings (body-mind dualism) led, as we saw in Chapter 2, to a distinctive conception of learning. The idea that learning is a process of disciplining or training minds gave us the classical traditional in education. Although actual teaching under the mind-training approach may appear highly mechanical, the conception of human nature underlying it definitely is nonmechanistic. It assumes a mind substance capable of free will and other spontaneous and "uncaused" behavior.

All associationist psychologies tend to be mechanistic, in the sense that they describe man and thought in the same physicalistic terms as are used by natural scientists. All of them—apperception, connectionism, behaviorism, and the neobehavioristic S-R associationisms—began as mechanistic theories of learning. Thus, with their coming there was an accompanying move toward rejection of vitalism or any other conception of life inconsistent with realists' interpretation of the universe. Consequently, with the advent of associationistic psychology, psychologists found themselves in increasing sympathy with the tenants of realistic philosophy.

Mechanistic-realistic psychology was an outgrowth of the attempt by S-R theorists to make psychology as "scientific" as physics. The issue between mechanistic and nonmechanistic psychology is nowhere stated more clearly than by the contemporary neobehaviorist D. O. Hebb. Hebb says flatly that psychology's only hope of remaining scientific is to assume that man is basically a mechanism. He says that there are only two alternatives so far as the basic outlook of a psychologist is concerned—mechanism and vitalism. *"Psychology,"* he says, "is the study of the more complex forms of organization in behavior, and of the processes such as learning, perception or emotion which are involved in the organization. . . . *Behavior* is the publicly observable activity of muscles or glands of external secretion as manifested in movements of parts of the body or in the appearance of tears, sweat, saliva and so forth. . . . The *organization* of behavior is the pattern, or combination, of separate items in relation to each other and to environmental stimulation."[10]

Furthermore, with respect to the type of study which psychologists can undertake, he says, "All one can know about another's feelings and awareness is an inference from what he *does*—from his muscular contractions and glandular secretions."[11] To a psychologist such as Hebb, Gestalt-field psychology would appear to be nothing more than "confusionism." The philosophical orientation of a mechanistic psychologist is so thoroughly realistic that any other outlook seems untenable.

Among S-R theorists, much use is made of the concepts *reflexes, reactions, objective measurement, quantitative data, sequence of behavior,* and *reinforcement schedules.* They have used these and similar expressions in an attempt to be rigidly scientific. To them, stimulus and response in psychology are equated with cause and effect in physics.

In his approach to education a realist, and likewise an S-R associationist, is very much an environmentalist and determinist in the sense that he assumes that the surrounding environment should, and inescapably will, control closely the behaviors and learnings of students. Thus, teaching practices advocated by S-R psychologists are closely in tune with the realistic outlook. Such psychologists tend to recommend that subject matter be selected by qualified adults prior to the teaching act, that it reflect facts and skills which are useful in contemporary society, and that it be inculcated into students. There is an implicit assumption that, if a given item of subject matter impinges upon a student, there will be a definite and predictable effect. Only secondary, if any, mention is made of such concepts as student goals, motives, or problem solving.

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[10] D. O. Hebb, *A Textbook of Psychology,* Saunders, 1958, p. 2.

[11] D. O. Hebb, *The Organization of Behavior; a Neuro-Psychological Theory,* Wiley, 1949, p. xiii.

Relativism and Gestalt-Field Psychology

Relativism has emerged during the past 70 or 80 years and is, in a sense, a reaction against the absolutistic ways which have characterized many facets of man's thinking throughout history. Relativism contrasts sharply with realism. The latter is absolutistic in that its exponents assume the existence of an ultimate reality which consists of fixed natural laws and they define truth as that which corresponds to natural law and consequently is unchanging. Relativists do not assert or deny absolute existence. Rather they define psychological reality as that which we "make" of what comes to us. They then deal with reality, so defined, in achieving truth and designing behavior.

Probably the central idea of relativism is that a *thing derives its qualities from its relationship to other things*. A person may look at a patch of grass which is in shadow. Compared with grass in the full rays of the sun, the patch appears dark; but compared with grass at night, it appears light. A homely girl, in the company of girls even more homely, appears pretty. The way we perceive any object or event is colored by the total situation. This principle is actually one with which everyone is familiar. Relativistic philosophy does little more than explore and develop the numerous ramifications and implications of this central idea.

It might appear that if relativism were a valid concept a person could never make a definitive statement about anything, except to say that it "is closer than something else," "is to the left of something else," "is darker than something else," "is smaller than something else."

However, this is not an insurmountable problem. In order to view something relativistically, one simply determines a convenient vantage point—a frame of reference. A man can say that his automobile has 200 horsepower, and such an assertion can be quite confident. The unit of measure, one horsepower, is an arbitrary measure—contrived by man and susceptible to future change—but it has definite usefulness as a point of reference. Such relatively fixed points of reference are *relatively absolute*. The word absolute, so used, is an adjective; it means no more than that the point of reference is one of relative fixity or stability.[12]

If one assumes that things have to be dealt with relationally, rather than as things-in-themselves, a distinctive method of defining truth, or knowledge, and an equally distinctive method of arriving at truth are required. A relativist rejects the notion that man is able to find and use final or absolute truth. Consequently, he has little, if any, interests in "eternal verities." Relativists regard knowledge as insights developed and held by human beings using human methods. As Bayles points out, the development of the notion that knowledge is a matter of human interpretation, and not a literal description of what exists external to man, reflects a shift from a realistic to a relativistic view of science.

A scientific law (including a principle of psychology) is a statement which seems true to all or most of those who are competent to study the matter. The relativistic test of truth is anticipatory accuracy, not correspondence to ultimate reality. Thus, in a sense, a scientific law is a generalization about which there is considerable agreement among those scientifically competent in its area; it is a matter of consensus. Its test, however, is not the consensus but its predictive accuracy. Relativists assume that no scientific law is "sacred"; any law may change, and indeed, over the course of time most will. A significant aspect of the thinking of relativists is their expectancy of change. They are much more likely than realists to think of both nature and culture as undergoing continuous modification.

But what grounds does a relativist have for judging anything true? To quote Bayles, an insight is considered true "if, and only if, the deduced behavior pattern, when tested experientially or experimentally, produces the results which were anticipated." Thus, an insight is true if it proves to be reasonably accurate—if what one supposes will follow from its application actually follows. To put it colloquially, a statement is true if it "pans out." Truth, to a relativist, is not based upon "eternal and universal principles." It is man-made, and man will change it as need be. This does not mean that truth is unimportant or ephemeral. It does mean that truth tends to evolve as human experience evolves.

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[12] The present discussion of relativism follows closely that in Ernest E. Bayles, *Democratic Educational Theory*, Harper & Row, 1960; see particularly chaps. 4 and 7.

Both realists and relativists assume that the most valid method of inquiry is scientific in nature; it is based on testable evidence. But they define "scientific method" in different ways and, as the foregoing discussion has indicated, seek different ends from it. To a relativist, scientific method is not merely a sequence of steps such as a physicist supposedly uses. Scientific thinking is any form of intellectual pursuit which is based on testable evidence and is productive in relation to the goals of the thinker. To be sure, there are some measuring sticks or criteria of scientific truth; these criteria Bayles has encompassed under the headings of adequacy and harmony. A conclusion, to be properly scientific, must *harmonize* all the data, that is, it must make the data "jibe," or "add up." If a single pertinent fact seems to "point the other way," if it remains unexplained, then the conclusion is not to be trusted. According to the principle of *adequacy,* all known pertinent facts must be taken into consideration. None may be ignored—no matter how unpalatable it might seem.

A relativist construes science much more broadly than does a realist. He assumes that the scientific way can be applied in a wide range of situations. A relativist does not think in terms of a hierarchy of sciences, with physics, chemistry, and mathematics at the top. He is also more flexible with respect to the kinds of data he will consider. A realist in psychology is likely to admit only data of observable physical objects or substances. Conversely, a relativist in psychology will consider all the data of human experience, including that which may seem introspective.

Gestalt-field psychology is essentially an emergent synthesis which developed from conflict between the psychological tenets of Roussellian "romantic naturalism" and those of "scientific realism." Roussellians contend that psychological development is primarily a matter of natural unfoldment. To them, learning is largely equated with unfoldment and is a product of inner urges. It is not imposed by a child's environment. Realistic psychologists, at the other extreme, see all development as a product of learning, and assume that learning comes from the environment; it is conditioning induced by stimuli which impinge upon a child from without.

The only way of bridging the two positions appears to be to assume that a child is what he is because of an interaction between him and his culture. With the emphasis upon interaction, the responsibility for development rests neither with the child alone (as Rousseau would have said) nor with the environment alone (as a realist says). It is in a person and his environment coming together —in a psychological field—that Gestalt-field psychologists find the clue to psychological development and learning.

What has this to do with relativism? Since the number of possible culture patterns is infinite, the possibilities for variety in human development become infinite likewise. Within its biological limits, human nature might become anything. Further, if one accepts the premises of Gestalt-field psychology, one must define reality in a manner different from that of a realist. To a relativist, reality consists of the *interpretations* a person makes of himself and his surroundings as he interacts. If reality is to be regarded as interpretations or meanings, rather than pre-existent physical objects, as such, it is obvious that reality will be in a constant state of flux. In 1947, Earl C. Kelley published an extraordinarily provocative little book entitled *Education for What Is Real.* By "what is real" Kelley means our *perceptions* of physical and social objects. Kelley's book depicts concisely and sharply many aspects of the issue concerning the definition of reality. Because this issue is of prime importance, the following section explores several of its facets.

HOW DO THE TWO FAMILIES DEFINE REALITY?

S-R associationists tend to treat reality and existence as identical. The term *existence* refers to what exists or "what is there," that is, physical objects and processes. The chair on which the reader is sitting may be said to exist, and to an associationist the chair is a good example of reality (not one's impression of the chair, but the chair itself). The chair exists in its own right; the way one perceives it is not relevant to its reality.[13]

Gestalt-field theorists make a distinction between reality and existence. Without denying independent existence of objects, or even of other people's ideas, they insist that each person sizes up or interprets his world in such a way that it will form a meaningful pattern for him, and his interpretation is the reality on which he designs his actions. A Gestalt-field psychologist thinks that a person's knowledge of things is always limited by the impossibility of his ever getting completely "outside himself." He assumes that any perception will be colored to some degree by the purposes and experiences of the observer, as well as by the procedures used in observing the perceived object. None of this should be taken to mean that a person literally makes his world; rather, in any field—science, social relations, morality, even religion—each individual makes, not the world, but his own notions of the world.

In order to understand fully the difference in definitions of reality between the S-R association and the Gestalt-field approaches, it is necessary to explore in some detail the differences between their exponents in their definitions of *environment, perception, interaction,* and *experience.* We already have suggested some of these differences. We propose now to dig more deeply. Some repetition of what has been said before is necessary.

How Is Environment Defined by the Two Groups of Psychologists?

S-R associationists maintain that a person's psychological and physical environments are identical; his environment consists of all his physical and social surroundings. Because environment is defined in objective, physicalistic terms, presumably anyone can see (or hear, smell, feel, or taste) the environment of anyone else.

In contrast, Gestalt-field psychologists think of a person's environment as psychological, and it consists of what he makes of what is around him. It is that portion of a life space or perceptual field which surrounds a person or self. A psychological environment includes impressions of parts of the physical environment but not necessarily all of it. It also extends beyond its physical environment. Sometimes a person's psychological environment includes largely memories or anticipations; in this case he is scarcely aware of the physical world currently around him. In Lewin's terminology, he is operating on an "irreality level."

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[13] The way in which we here use the term *existence* bears no relation to the way it is used by existential philosophers. Their "existence" is a philosophical and not a physical concept.

Since each person's perceptual environment is unique, obviously two persons may appear to be in the same location in space and time (or as nearly so as possible) and yet have very different psychological environments. Furthermore, the behaviors of two equally intelligent persons who are confronted with the same "objective facts" may differ drastically because each is different in his purposes and experiential background. Whenever a person has a new experience, he changes his environment and will never again be able to recapture the old environment in its identical form. The Gestalt-field conception of environment explains why in a particular family one son may become a minister and another turn to crime; their interpretations of their world differ radically, even though to an outsider their social and physical environments would appear quite similar.

How Do the Two Groups Define Perception?

S-R associationists define perception in such a way as to make it analogous with taking photographs. The sense organs in literal fashion "read" a person's social and physical surroundings and record this "reading" in the nervous system. After sensing something, a person may derive a meaning for it. But note that, according to an associationist, sensation comes prior to meaning and the two acts, sensing and finding meaning, are regarded as separate. An S-R associationist assumes that sensation may be indiscriminate, in that a person tends to "take in" all aspects of the physical world to which his sense organs are sensitive. Such a psychologist defines perception, then, as a two-step process (sensing and deriving meaning) which focuses on particular objects of the environment only insofar as previous conditioning directs.

A Gestalt-field psychologist, on the other hand, does not separate sensation of an object from its meaning. In his view, a person will rarely sense an object unless it has relevance to some purpose of the person. It is this relevance to purpose, this instrumental quality, of an object which constitutes its meaning. Unless a person sees some meaning in an object, he will pay little or no attention to it. Thus, a Gestalt-field psychologist sees perception as a unitary process, in which sensation hinges on meaning and meaning on sensation, and sensing and finding meaning occur simultaneously. Perception, to a field psychologist, is highly selective. It is always related to a person's purposes at the time of perception. In his goal-seeking behavior, a person actively seeks out those aspects of his environment which will help or hinder him, and usually it is to these that he is primarily sensitive.

Furthermore, to a Gestalt-field psychologist the meaning of a sensation or perception is always related to the total situation. Relationships, and not a summation of individual elements determine the quality of any event (such as perception). Any psychological event is a result of the interaction of many factors; hence, perception always involves a problem of organization. A thing is perceived as a relationship within a field which includes the thing, the viewer, and a complex background incorporating the viewer's purposes and previous experience. Considering the above notions, it is obvious that to a Gestalt-field theorist the senses do not directly mirror physical objects in their geographical environment. The camera analogy which fits the associationist's idea of perception seems, to a field psychologist, gross oversimplification.

Is Interaction of Person and Environment Alternating or Simultaneous and Mutual?

The term *interaction* is commonly used in describing the person-environment process through which reality is perceived. Both families of psychology use the term but define it in sharply different ways. Whereas S-R association theorists mean the *alternating reaction* of organism, then of environment, Gestalt-field psychologists always imply that the interaction of a person and his environment are *simultaneous* and *mutual*—both mutually participate at the same time.

ALTERNATING REACTION. Alternating reactive interaction begins with a reaction of a person to a stimulus. The person is regarded as a passive receiver of stimuli; his habitual pose is one of waiting or repose. When he receives a stimulus he reacts in whatever way he must—in accordance with the conditioned or innate reflexes which are called into play. When he reacts, it is likely that he will change his physical or social environment in some way. (The environment is also passive, in the sense that it "waits" for him to do something to it.) To an associationist, the temporal sequence of the interactive process is stimulus-reaction-stimulus-reaction, and so on. The chain of S-R's may continue indefinitely. Consider an example. A dog bites a man; the man kicks the dog. Let us suppose the kick conditions the dog not to bite. The dog is friendly toward the next man he encounters, and the man reacts by patting him on the head. The dog may then react by licking the man's hand. The man may then buy the dog a steak. And so on, ad infinitum.

S-R associationists may think of interaction as involving only physical processes. That is, material objects react to other material objects. Interaction between human beings is analogous to the interaction of molecules in a chemical compound. One molecule strikes another, which is deflected against another, which hits another, and so on. The interactive process is regarded as a chain of causes and effects; stimuli are causes and responses are effects.

SIMULTANEOUS MUTUAL INTERACTION. Interaction, when used by Gestalt-field psychologists, refers to a relationship between a person and his environment in which the person in purposeful fashion tries to see meaning in his environment and use objects in his environment in advantageous ways. As he interprets and uses his environment for his own purposes, both are changed. The person's physical environment may be changed in ways which others may observe; or it may not. In any case, its meaning is changed, so that it looks different to the person interacting with it. The person changes in the sense that through interaction he achieves new insights which literally transform him, in however minor ways. Gone from this concept of interaction is the idea of the reaction of a passive organism to a stimulus, and an ensuing chain of S-R's running back and forth from organism to environment. Rather, we now have a simultaneous mutual relation of a person and his environment, during which we do not make a sharp distinction between the two. In symbolic terms, this concept is simultaneous mutual interaction —the SMI concept.

Parents and siblings usually constitute important aspects of a child's environment. When a second child arrives in a family, the first child sizes up—perceives—the situation. Whether the first child feels rejected depends not upon the physical stimuli he receives from his parents and the sibling but upon what he makes of the relationship of the parents and the second child. The important question is not, Do the parents actually favor child number two? but rather, Does child number one "see" child number two as favored over child number one—himself? In this situation, the parents and the other child are key aspects of each child's and parent's environment. The way child number one perceives the situation has important bearing upon the environments of child number two and the parents. Each person in a situation interacts with the others.

Gestalt-field theorists, in their espousal of the concept of SMI, make a sharp distinction between interaction of physical objects in a physical environment and (the subject of psychology) interaction of psychological realities in a psychological environment. To a field psychologist, it is only what occurs in a person's life space which, at that moment (or a longer unit of time), is important to that person. A person interacts by relating himself (as he understands himself) to his interpretation of what is around him. Of course, while interacting, he may move his body and manipulate objects in his physical environment in ways conspicuous to observers. But psychological interaction and physical reaction are two different processes. A person can interact within a psychological field while he is seated in an armchair in front of a fireplace. Human experience is synonymous with an interactive event. It does not necessarily require any kind of motion which an observer can detect.

Any idea can be ridden too hard, and the reader has probably already thought of cases in which the concept of SMI does not seem to fit. For example, a man who is not aware of danger may be shot in the back. It seems fairly clear that in such a case the man has been a passive victim of a feature of his environment which was active in relation to him. However, all this example suggests is that there are situations in which a person has no control over what happens to him. Gestalt-field psychology and relativistic philosophy do not deny this; instead, they operate on the not inconsistent assumption that, whenever a person can, he seeks to manipulate purposefully all those aspects of his environment which at the time mean anything to him. He may or may not be successful, but whether or not he is, his life space will be different as a result of the attempt.

What Is Experience?

Up to this point, we have used the term "experience" without really coming to grips with its meaning. Gestalt-field psychologists regard experience as a pivotal concept in any discussion of the interactive process and the meaning of reality. S-R associationists, in contrast, make little use of the term, especially in connection with any investigation or description which is supposed to be scientific. Most S-R associationists charge that Gestalt-field psychologists use the term "experience" in such a way as to imply existence of a process which does not involve the real physical world at all, but only "mentalistic" copies of it. According to associationists, the concept, experience, presupposes a special world of consciousness and, even if consciousness does exist, it does not lend itself well to scientific study.

An associationist may concede that thought appears to occur, but is likely to insist that, if human beings are to be studied with true scientific objectivity, most kinds of mentalistic concepts must be ruled out of bounds. The well-known neobehaviorist B. F. Skinner expresses this notion clearly: ". . . the private event [that is, thought or consciousness] is at best no more than a link in a causal chain, and it is usually not even that. We may think before we act in the sense that we may behave covertly before we behave overtly, but our action is not an 'expression' of the covert response [that is, thought] or the consequence of it. The two are attributable to the same variables."[14]

[14] B. F. Skinner, *Science and Human Behavior*, Macmillan, 1953, p. 279.

If an S-R associationist were to use the term "experience," he would have to define it mechanistically. To him, experience could mean no more than the conditioning process by which a person acquires a new response. If a child touches a hot stove and if a link is formed between the sight of a stove and a withdrawal response, then an associationist might say the child has had an experience. No thought needs to have occurred and no insights need to have been developed.

Gestalt-field psychologists use the term "experience" extensively, but define it in a way consistent with a relativistic outlook. They regard experience as rooted in insightful behavior. From this point of view, experience is a psychological event which involves acting purposefully with anticipation of the probable or possible consequences of such action. Experience is interaction of a person and his perceived environment. This is what Dewey means when he says, "An experience is always what it is because of a transaction taking place between an individual and what, *at the time,* constitutes his environment."[15] He states further, in connection with experience and learning, that "To 'learn from experience' is to make a backward and forward connection between what we do to things and what we enjoy or suffer from things in consequence."[16] Experience includes an active and a passive element, combined in a peculiar fashion: "On the active hand, experience is *trying*. . . . On the passive, it is *undergoing*. When we experience something we act upon it, we do something with it; then we suffer or undergo the consequences. We do something to the thing, then it does something to us in return: such is the peculiar combination. The connection of these two phases of experience measures the fruitfulness or value of the experience. Mere activity does not constitute experience."[17]

The SMI concept implies a continuity of experience. Every experience both extracts something from experiences which have gone before and modifies in some way experiences which follow. Furthermore, to some degree every experience influences the conditions under which future experiences may be had. Thus, in the case of a reasonably normal person, successive perceptual fields or life spaces tend to be similar to, though not identical with, one another.

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[15] John Dewey, *Experience and Education,* Macmillan, 1938, p. 41 (our italics).

[16] John Dewey, *Democracy and Education,* Macmillan, 1916, p. 164.

[17] *Ibid.,* pp. 163–164.

WHAT DOES MOTIVATION MEAN TO EACH FAMILY?

Motivation refers to the "mainsprings" or instigating forces of behavior; people do what they do because of motivation. As in the case of concepts treated previously in the chapter, S-R associationists and Gestalt-field psychologists hold contrasting and seemingly incompatible ideas about the nature of motivation. These differences go back to the contrasting conceptions of basic human nature held by the two schools of thought. If one views man and the universe mechanistically, he will prefer a theory of motivation compatible with this opinion; if he views man as a purposeful, reflective, and creative individual, he will have a quite different theory of motivation.

What Is Motivation to S-R Associationists?

As we have seen, associationists tend to regard man as an intricate machine. Machines operate with induced regularity, according to fixed principles. Even a machine as complicated as an electronic brain does not operate purposefully as we usually use the term. An electronic brain does not know what to do until it has been set by a human being. Even electronic brains which can correct their own errors and do other seemingly fantastic tasks still behave as they do because some person has designed and regulated them. In a sense, a machine has no more purpose than a falling rock; it acts, but it has no thought-out goal. S-R theorists generally attribute this same quality to human nature.

To an S-R psychologist, all motivation is assumed to rise directly from organic drives or basic emotions or from a tendency to respond established upon prior conditioning of the drives and emotions. Organic drives, such as hunger, thirst, and sexual need, and the emotions, fear, anger, and "love," supposedly produce behaviors which are both predictable and irresistible. The drives and emotions are "built into" the organism and it can do nothing to resist them. Conditioning produces a series of learned reflexes which spring into action whenever relevant stimuli appear. These conditioned responses operate more or less automatically; a person makes them because he must. Through conditioning, the machine—the body—has been regulated to behave in a predictable manner. To an S-R psychologist, then, all behavior is stimulus directed, whether the stimulus comes from within the organism or without. Motivation is defined as the urge to act which results from a stimulus. Since behavior is stimulus-directed, it is not related to purpose of any kind.

There are certain obvious aspects of the behavior of men or lower animals which do not appear to be explained by the mechanical concepts of S-R theory. One of these is attention. At any given time, a person pays attention to one thing rather than another. At this moment, the reader of this book is "attending" to this page rather than to a television program, a poker game, or a pretty girl. So the fact of attention seems to demonstrate that human behavior is governed by purpose. S-R theorists concede that a person may often respond selectively to one or a small group of stimuli at a time. However, they argue that what appears to be selective response can be explained according to S-R principles and that the existence of purpose need not be assumed. A person selects one response rather than another, according to an S-R psychologist, because of the particular combination of prior conditioning and present physiological drives and stimuli which are operating at the moment of perception. To an S-R theorist, to introduce purpose as an explanation of motivation is to risk introducing some kind of supernatural guiding force and to make impossible a truly scientific approach to the study of behavior.

An associationist's theory of motivation has important implications for education. According to his viewpoint, a child does not have to "want" to learn history in order to learn it. He does have to be persuaded to study it, to repeat the verbal responses which we associate with a knowledge of history. Anyone can learn anything of which he is capable if he will only allow himself to be put through the pattern of activity necessary for conditioning to take place. Thus, an associationist does not talk much about such things as "psychological involvement" or "helping students see the point of learning." Instead, he engages students in activity and assumes that activity with reinforcement automatically produces learning. A teacher carefully plans which learnings (responses) he wants students to develop. He then induces these responses and associates them with stimuli.

What Is Motivation to Gestalt-Field Theorists?

Within the Gestalt-field frame of reference, behavior is a function of a total situation—a person interacting within a field of psychological forces, which includes memories, anticipations, purposes, and interpretation of relevant physical objects and events. Motivation cannot be described as merely an impulse to act triggered by a stimulus. Rather, motivation emerges from a dynamic psychological situation, characterized by a person's desire to do something.

A Gestalt-field psychologist regards motivation as a product of disequilibrium within a life space. A life space includes goals and often barriers to the achievement of these goals. A goal may be either positive or negative—something one wants to achieve, or something one wants to avoid. When a barrier, that is, any obstacle to the direct and immediate achievement of a goal, whether physical or psychological, appears, a person feels tension. He tries to relieve tension by surmounting the barrier. The tendency to release tension by proceeding toward a goal, including the overcoming of whatever barriers are in the way, is motivation.

The particular form which motivation takes and its intensity are functions of a field of psychological forces in which no distinction can be made between "inner" and "outer." That is, one cannot identify a category of forces which stems exclusively from physiological drives and another category which stems from the outside environment. Hence, a Gestalt-field psychologist objects to the manner in which an associationist attributes motivation to independently acting organic drives and stimuli which originate wholly from outside an organism.

S-R theorists in the Thorndikean tradition make much of pleasure and pain, or satisfaction and annoyance, as instigators of behavior. An organism presumably is so put together biologically that it seeks to achieve pleasurable states and to avoid painful ones. Gestalt-field psychologists are more likely to talk about success and failure as motivators, the former being the "reward" for completing an act. Success and failure are not merely achievements as such but represent the relationship between a person's ambitions and his achievements. If he has a certain level of aspiration and is able to achieve this level, he feels good about it. If he attains success at one level of aspiration, he is likely to raise the level, and to continue doing so as long as he is able to perform successfully. Thus, goals tend to be self-set and to change in dynamic fashion with each new experience.

Another feature of the Gestalt-field theory of motivation which sets it apart from S-R theory is the emphasis placed on the present situation. Motivation, to a Gestalt-field theorist, grows out of one's contemporary life space—the psychological forces which are operating right then. In constrast, an S-R theorist tends to think of motivation as emerging from an accumulation of historical events: past conditionings, coupled with currently operating organic drives. An S-R theorist looks backward into a person's life to determine why he behaves as he does now. A Gestalt-field psychologist does not ignore the impact of previous experience on a person's contemporary life space, but in explaining the causes of behavior he focuses on the present scene as the person experiences it. For these reasons, it is common to think of S-R psychology as embodying a *historical* approach and Gestalt-field psychology as embodying a *situational* approach to the study of motivation and behavior.

A teacher who accepts the Gestalt-field concept of motivation and a teacher who operates within an S-R framework are likely to approach teaching in fundamentally different ways. For one thing, a teacher with a Gestalt-field orientation is concerned always with the problem of personal involvement, that is, helping students see a need to learn. The personal goals of students will always be relevant. This does not mean that he will cater to their every whim. Often he will try to help them rethink their goals and discard those which are trivial and whimsical. Much of the time he will attempt to arrange the teaching-learning situation so that students will adopt goals entirely new to them. He will not forget that, unless a child realizes a need to learn something, the child either will not learn it at all or will learn it only in a transitory and functionally useless way.

BIBLIOGRAPHY

NOTE: References pertaining to Chapters 3 and 4 are at the end of Chapter 4. These two chapters should be studied as a unit.

CHAPTER 4

How do the two families of learning theory describe the learning process?

THIS CHAPTER CONTINUES the analysis begun in Chapter 3 but centers on some of the more technical aspects of the learning theories developed by S-R associationists and Gestalt-field theorists. Some repetition of ideas stated in Chapter 3 is inevitable, but the focus is quite different.

Do animals, including man, learn simply by being conditioned step by step under the tutelage of a teacher or experimenter, or do they learn by surveying their situation and grasping relationships? Let us set up a hypothetical experiment and speculate on how animals will behave. Our subjects will be rats in an elevated maze (see Figure 4.1). The alleys are formed of strips of wood without sidewalls. They are raised high enough from the floor so that the rats will not jump off. The gate in the maze is made so that the weight of a rat will cause to lower and permit the rat to run through.

In order to accustom the rats to the maze and to develop in them preferential tendencies with reference to the three possible pathways to food, we give them some preliminary training. We deprive them of food for 24 hours, then place them in the starting box and permit them to find their way to the food box. They are given ten such trials per day and soon learn (after trying the various paths) to take the shortest, path 1, to the food. We then block path 1 at point A. When this is done, the rats will turn back to the choice point (fork in the road) and almost always (about 93 percent of the time) take path 2.

Now, what will the rats do when for the first time the block is

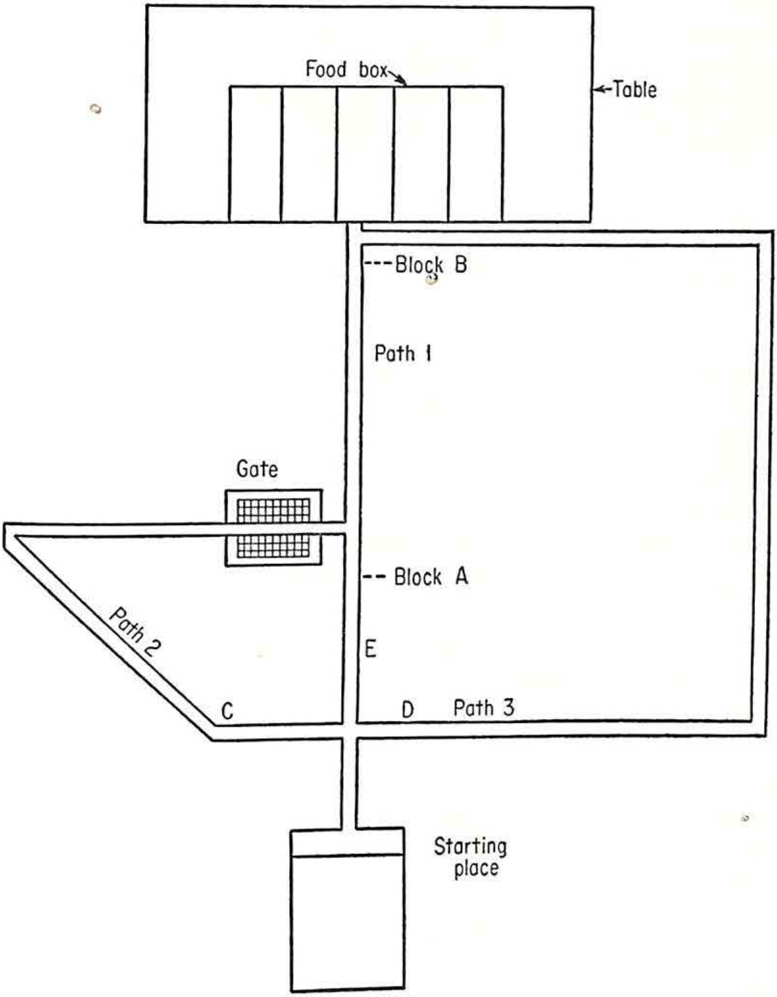

FIGURE 4.1 *Ground Plan of Elevated Maze Used by Tolman and Honzik. From Ernest R. Hilgard,* Theories of Learning, *Appleton-Century-Crofts, 1956, p. 194.*

placed in the common section of paths 1 and 2 (at point B)? They will return toward the starting place on path 1 and turn at the intersection of the three paths. But will they take path 2 or 3? Have they sized up the situation and "seen" that the block is on path 2 as well as path 1? If so, they will take path 3. On the other hand, if the rats are operating mechanistically they will take the second shortest path to the food, path 2, at least half the time.

We will return to our experiment. But first let us consider the significance for man of a learning theory based upon experiments with animals. Such experiments occupy a very important place in modern psychological theory.

DO MEN AND OTHER ANIMALS LEARN ALIKE?

Use of results of animal experimentation is governed by the assumptions that the learning process is essentially the same throughout the animal kingdom and that what we discover about animal learning is transferable to human situations. These assumptions would have been thought ridiculous, if not heretical, a few centuries back. Until modern times, philosophers took for granted that there was an unbridgeable gulf between man and the animal kingdom. It was thought that human beings possessed a unique quality: they could reason, whereas animals could not. This quality was believed to arise from the existence of a substantive mind: a mind force, relatively independent of a body, which only man, among the earth's creatures, possesses.

Chapter 2 describes the manner in which this belief in body-mind dualism led to a distinctive theory of learning and teaching—mental discipline. So long as man was considered fundamentally different from other forms of life, animal biology and human psychology remained two sharply separated disciplines. Until a century or so ago, human psychology relied for its source of knowledge solely upon the study of humans—conducted through inspiration, introspection, and intuition, tempered by reason.

There were a few persons of the past who rejected the idea that man and animals are unrelated; of these Rousseau is one of the earliest and most striking. In his book *Émile* (1762), Rousseau strongly implied that a continuity exists between animal and human nature. According to Rousseau's theory of child nature, a human being at birth is a healthy little animal—a creature like other animals of nature.

During the Romantic period (late eighteenth and early nineteenth centuries) many philosophers and literary figures believed that mind permeated the entire universe, including all living things. Furthermore, this universal mind substance was believed to be unitary—everywhere the same. Man possessed more of it than did lower animals, but the difference between human mind and animal mind was one of degree rather than kind. Of course, not all scholars accepted this view. The psychologist Wundt, for example, was convinced that consciousness—a product of mind—was unique to human beings.

Do Men Learn Like Other Animals?

It was the work of Darwin and other evolutionists of the nineteenth century that most definitely gave man a place in the animal kingdom. Darwin noticed particularly the close similarity of the bodily structures and functions of man and the lower animals. In his *Descent of Man* he also presented much evidence of the existence of psychological, as well as physical, continuity throughout the animal kingdom. He wrote, "There is no fundamental difference between man and the higher animals in their mental faculties."[1] But in a later section he qualified this opinion by writing, "There can be no doubt that the difference between the mind of the lowest man and that of the highest animal is immense."[2] In spite of the qualification, Darwin appears to have maintained consistently that in their fundamental aspects man and the lower animals exhibit a commonality of both physical and mental characteristics.

Antagonists of the theory of evolution defied Darwin to explain why, if there is a continuity between man and the animal kingdom, man can reason, whereas lower animals seem to be governed by instinct rather than reason. Darwin countered with the explanation that much human action, too, is to be interpreted as instinctive in origin and that animals, on their level, exhibit a capacity for reason.

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[1] Charles Darwin, *The Descent of Man,* Appleton-Century-Crofts, 1920, p. 66.

[2] *Ibid.,* p. 125.

During the latter part of the nineteenth century the idea that there is a continuity among animal species, and that behavorial tendencies, including learning, are broadly similar throughout the animal world, rapidly gained in popularity among biologists and psychologists. Pierre Flourens, we have noted (p. 54), proposed in the nineteenth century that conclusions drawn from animal experimentation should be equally applicable to man. Pavlov made this assumption also, as did his contemporary, Thorndike, in the United States.

In addition to the cheapness and convenience of using lower animals rather than humans in a psychological laboratory, obviously experiments can be performed on animals which our mores would prevent being tried on people. Furthermore, many persons have felt that it was easier to isolate simple units of behavior in lower animals than in human beings; although in humans the units may be substantially the same, they are often combined in a manner too complex for ready study. Thus, it was thought that one might learn more about types of behavior fundamental to the animal kingdom by studying the lower animals than by studying men. For all of these reasons, animal experimentation became extremely popular among psychologists.

In the preceding chapter we describe briefly the general nature of the animal experimentation undertaken by S-R associationists. These psychologists hoped to formulate laws of human learning by observing overt behavior of laboratory animals placed in various kinds of situations such as puzzle boxes and mazes. By the early 1920s, the manner in which behaviorists conducted their experiments came under the fire of Gestaltists. The nature of the Gestalt-field criticism is developed in the following section.

Do Other Animals Learn Like Men?

Whereas the behaviorists assumed that men learn like animals, and more specifically like their own experimental animals in their own types of experiment, Gestalt-field psychologists gave the question a reverse twist: Do animals learn like men? Of course, if there is a continuity between man and the lower animals, both ideas should make equal sense and both should be answerable in the affirmative. But Gestalt-field psychologists had something else in mind. While not denying the likelihood of a fundamental similarity in the behavior of man and other animals, Gestalt-field theorists were interested in raising questions about the whole approach of the behaviorists.

Gestalt-field psychologists noted that behaviorists usually placed their animals in situations entirely foreign to them. There was no place for them to begin a solution and they were permitted a bare minimum of freedom in which to try. Locks, levers, and mechanical devices used were above the animals' level of comprehension. In order for them to achieve the correct procedure it was necessary for them to stumble onto the key by chance. Because lower animals are less discerning of relationships which seem important to men than are human beings, animals appear, in a humanly contrived "problem," to make completely random movements. Thus, the nature of their discovery of the relationship between the release mechanism and escaping from a puzzle box, on the surface, appeared to be completely mechanical. Having set the stage against animals displaying genuine problem-solving activity, S-R associationists concluded that learning is a product of a mechanical trial-and-error process.

One of the sharpest criticisms which a Gestalt-field theorist can make of the behavioristic conception of learning is directed against the tendency of the latter to deny purpose a central role in learning. To a Gestalt-field psychologist, learning always involves purpose. The tension which motivates an animal to learn is tension *toward a goal.* Gestalt-field psychologists feel they have abundant experimental evidence to show that learning is purposive even among animals quite low on the phylogenetic scale.

An animal with purpose does not make random motions—even though it may appear so on the surface. It tries everything at its command, but if the problem is too difficult its trial moves will appear to an observer as random. If one eye of a slug or honeybee is blinded, the animal at first glance appears to go through meaningless motions. However, more careful observation reveals that it is demonstrating something other than mere random response. It assumes a posture which orients its body toward the light source; it flexes its legs on one side and extends them on the other as if it wanted to move in relationship to the light.

Gestalt-field psychologists have criticized experimentation of behaviorists on the ground that it was so arranged that, even if animal learning were insightful, the development of insight would not show. *The real nature of any psychological process can be concealed if the experimenter designs his experiments in line with predetermined conclusions, and this is precisely what the Gestaltists insist S-R associationists are inclined to do.* In an attempt to refute the contention of behaviorists that learning is mechanical—a mere matter of forming the right connections through chance—the Gestaltists designed an entirely different type of animal experiment. Their experiments involved creation of problematic situations which animals might conceivably resolve through development of insight. These situations were geared in difficulty to the presumed potential intelligence of the animals being studied.

Let us now return to the three-path experiment described at the beginning of the chapter. This actually is a classic experiment performed by Tolman and Honzik at the University of California. When the rats backed out of path 1, they did not take path 2 but path 3—the longest path, but the only one now open to the food box. *Of the 15 rats, 14 behaved in this way.* The rats' backing out of path 1 and taking path 3 was an indication of their having "sized up" the situation—of their having developed insight. Using path 3 was a relatively new and creative solution of what, to the rats, was a real problem.[3]

Köhler's famous experiments with chimpanzees further illustrate the Gestalt-field approach to animal experimentation. Köhler spent four years on the island of Tenerife working with chimpanzees. A typical experiment involved suspending food (usually bananas) from the ceiling of a cage and then providing a chimpanzee with a tool or tools with which to knock down or reach for the fruit. The tool might be a pole of adequate length, a pole in sections which had to be joined, or boxes which could be stacked and climbed.

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[3] E. C. Tolman and C. H. Honzik, "'Insight' in Rats," *University of California Publication in Psychology,* Vol. 4, No. 14, pp. 215–232.

Köhler's chimpanzees, rather than gradually acquiring right responses and eliminating wrong ones, seemed at some point in a problem to develop insight into it—to grasp, often rather suddenly, the relationship involved. The chimpanzees seemed to get the idea of "tool use" and to apply it in new situations calling for tool use.[4]

Köhler also experimented with "stupid" chickens and found considerable evidence that even chickens can see relationships and that it is relationships to which they respond rather than specific stimuli. He taught chickens to expect food only from the darker of two papers placed side by side. For the lighter paper he then substituted one even darker than the original dark one. In 70 percent of the trials the chickens switched their preference from the originally preferred dark paper to the paper which was still darker, suggesting that they had achieved an insight: "If I go to the darker of two surfaces, I will get food." The chickens had "generalized," that is, sensed the relationship of darker to lighter *as a general principle* in "food getting."[5]

Two American Gestalt psychologists, Raymond H. Wheeler (1892–) and Francis T. Perkins (1909–), performed a great deal of animal experimentation in the 1920s and 1930s. Among their most frequently cited experiments was one with goldfish in which the fish received food after responding properly to a configuration of lighting. The fish learned to pick the light of brightest, medium, or dimmest intensity, even though the experimenters kept varying the absolute intensity and the serial arrangement of lights. Wheeler and Perkins report numerous other studies made by themselves and others in which animals ordinarily regarded as not very intelligent learned to respond to relationships in an apparently intelligent way.[6]

The question arises, How far down the phylogenetic scale can an investigator go and still observe animals behaving as if they could generalize, that is, perceive a relationship? To perceive a relationship one must get the feel of how a thing works. At first thought it would seem that to do this an animal must have a certain minimum of sensory and neural equipment—perhaps at least a brain, even if only rudimentary. However, one well-known American biologist, H. S. Jennings (1868–1947), writing in the early 1920s, concluded differently. Jennings spent much time observing the behavior of protozoa, such as euglenae, paramecia, and amoebae. He found that the actions of protozoa are not only highly variable but also readily modified, and he decided that their behavior could not be explained merely in terms of simple physiochemical reactions. Jennings thought that, insofar as their observable behavior was revealing, it was as reasonable to infer the presence of conscious behavior among protozoa as it was among men.[7]

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[4] Wolfgang Köhler, *The Mentality of Apes,* Harcourt, Brace & World, 1925.

[5] See Henry E. Garrett, *Great Experiments in Psychology,* Appleton-Century-Crofts, 1941, pp. 216–219.

[6] Raymond H. Wheeler and Francis T. Perkins, *Principles of Mental Development,* Crowell, 1932.

What are we to conclude from all this? One possible conclusion is that an animal experimenter, depending upon his orientation, is likely to arrange his experiment so that animal behavior appears to be either chancelike and mechanical or insightful. A famous philosopher, Bertrand Russell, noted before the end of the 1920s that psychologists could demonstrate two fundamentally different types of response in their animal experiments, depending entirely on how they arranged the experimental situation. Russell commented humorously: ". . . Animals studied by Americans rush about frantically, with an incredible display of hustle and pep, and at last achieve the desired result by chance. Animals observed by Germans sit still and think, and at last evolve the solution out of their inner consciousness."[8]

The state of affairs with regard to experimentation with lower animals is probably not as indecisive as Russell's comment would lead one to think. Once a student sets his orientation in either an S-R associationistic or a Gestalt-field point of view, he benefits by the broadest possible knowledge of all available experimental, as well as other, evidence.

Behaviorists have clearly shown that animals can be put in experimental situations where they demonstrate overt behavior which seems trial-and-error, chancelike, blind, and mechanical. There seems to be little question but that human experimental subjects could be put in situations which would cause them to appear to demonstrate the same kind of behavior. The requirement of such experiments seems only to be that the problem presented the learner is one with which his previous experience has in no way equipped him to cope.

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[7] H. S. Jennings, *Behavior of the Lower Organisms,* Columbia University Press, 1923, p. 335.

[8] Quoted in W. D. Commons and Barry Fagin, *Principles of Educational Psychology,* Ronald, 1954, p. 28. Originally in Russell's *Philosophy,* 1927. The Germans referred to are obviously the Gestaltists.

On the other hand, the Gestalt-field group of psychologists have demonstrated adequately the one point they wanted to make, namely, that whether one is dealing with the lower animals or man, situations can be arranged in which learning shows an "Aha!" quality. That is, an experimental subject, in learning something, seems to "catch the point" or get the feel of a confronting situation. If man and the lower animals do seem to learn insightfully in situations which permit it, then serious doubt is cast upon the validity of the behaviorist notion that learning is purposeless, mechanical, and chancelike.

Gestalt-field psychologists insist that to describe learning throughout the animal kingdom we do well to begin with human examples. As we examine conscious behavior of ourselves or others, learning often—and perhaps always—appears to be a matter of *seeing through things,* of *gaining understanding.* If we start with the assumption that other animals learn in the same way, we devise experiments which will enable them to reveal such learning.

This does not mean that if we are studying, say, a dog, we dare anthropomorphize him,—attribute to him human characteristics; it does mean that we must guard against mechanizing him,—making a machine of him. The way to study a dog is to "dogize" him, just as in studying a child we should "childize" him. In short, we must consider each animal as well as each human being on its own level. If we always keep this in mind, we can probably make some generalized statements about learning which will hold true with respect to most or even all forms of animal life.

WHAT ARE THE TWO MAJOR CONTEMPORARY VERSIONS OF THE NATURE OF LEARNING?

In Chapter 3, we open discussion of the two major contemporary versions of the nature of learning. We now treat them in some detail. As already noted, whereas contemporary S-R associationists—the neobehaviorists—conceive of learning as *conditioning* or *reinforcement,* Gestalt-field psychologists think of it as *development of insight.*

Is Learning Conditioning-Reinforcement?

In the eyes of neobehaviorists, learning is more or less permanent change of behavior which occurs as a result of practice. Thus, the learning process consists of impressions of new reaction patterns on pliable, passive organisms. Since learning arises, in some way, from an interplay of organisms and their environments, the key concepts of neobehaviorists are *stimulus* (that excitement which is provided by an environment) and *response* (that reaction which is made by an organism). Consequently, the problem of the nature of the learning process is centered in a study of the relationships of processions of stimuli and responses and what occurs between them. Since the focus always is upon behavior, in practical application, a neobehavioristically oriented teacher strives to change behaviors of his students in the desired direction by providing the right stimuli at the proper time.

Neobehaviorists use "conditioning" or "reinforcement" to describe the learning process as they understand and interpret it. "Conditioning" is so called because it results in formation of conditioned responses. A conditioned response is a response which is associated with, or evoked by, a new—conditioned—stimulus. Conditioning implies a principle of adhesion; one stimulus or response is attached to another stimulus or response so that revival of the first evokes the second.

Reinforcement is a special kind or aspect of conditioning within which the tendency for a stimulus to evoke a response on subsequent occasions is increased by reduction of a *need* or of a *drive stimulus.* A "need," as used here, is an objective, biological requirement of an organism which must be met if the organism is to survive and grow. Examples of needs are an organism's requirement for food, sex, or escape from pain. A "drive stimulus" is an aroused state of an organism. It is closely related to the need which sets the organism into action, and may be defined as a strong, persistent stimulus which demands an adjustive response. When an organism is deprived of satisfaction of a need, drive stimuli occur.

What Are the Possible Kinds of Conditioning?

There are two kinds of positive conditioning—*classical* and *instrumental*—and a negative conditioning process—*extinction.* Through classical and instrumental conditioning, an organism *gains* responses or habits; through extinction it *loses* them.

CLASSICAL CONDITIONING. Classical conditioning usually is associated with such incidents as Pavlov's teaching a dog to salivate at the ringing of a bell; it is *stimulus substitution.* In Pavlov's conditioning experiment, the sound of a bell occurred prior to, or simultaneously with, the dog's salivation, which was caused by the presence of food. Then in the future the dog salivated at the ringing of the bell, even when the food was not present.

In classical conditioning a new stimulus is presented along with an already adequate, unconditioned stimulus—such as the smell of food—and just prior to the response, which is evoked by the unconditioned stimulus. The new stimulus becomes the conditioned stimulus, and the response which follows both stimuli becomes the conditioned response. Thus, in classical conditioning, an organism learns to respond to a new stimulus in the same, or similar, way it responds to the old, unconditioned stimulus. In Pavlov's experiment, the sound of the bell became the new, conditioned stimulus which evoked the old, unconditioned response—salivation. Then, salivation was a conditioned response.

Classically conditioned learning is revealed in the behavior of an organism by the increasing capacity of a previously neutral stimulus, with successive training trials, to evoke a response which originally was evoked by some other (unconditioned) stimulus. A "neutral stimulus" is one whose first occurrence does nothing toward evoking or reinforcing the response which is under study.

INSTRUMENTAL CONDITIONING. Just as classical conditioning theory derives from the early work of Pavlov, instrumental condition theory has emerged from the foundation built by Thorndike. Instrumental conditioning usually is equated with reinforcement; it is response modification or change.[9] An animal first makes a response, then receives a "reward"; the response is instrumental in bringing about its reinforcement. There is a *feedback* from the "rewarding" stimulus which follows the response that the organism is learning; a dog is fed after he "speaks" and, thereby, the likelihood of his "speaking" in the future is increased.

EXTINCTION. Extinction is the process whereby an organism gradually loses a response or habit through repeating the response a number of times while no reinforcing stimulus accompanies it. Any habits gained through either classical or instrumental conditioning may be lost through extinction.[10]

How Does Reinforcement Occur?

Neobehaviorists, who emphasize the importance of reinforcement in learning, assume that some psychological conclusions are fairly well established: (1) patterns of action and expectation develop through an organism's responses to repeated stimuli accompanied by "fumble and success" type of trial and error learning under conditions of positive or negative reinforcement; (2) reinforcement occurs through satisfaction of either basic biological needs like hunger or sex, or secondary needs such as a need for security, recognition, or aesthetic gratification; and (3) educational encouragement must take the form of positive and negative reinforcers. A positive reinforcer is a stimulus which strengthens a behavior; a negative one is a stimulus whose withdrawal strengthens a behavior. Note that negative reinforcement, psychologically, is different from punishment.[11]

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[9] Spence's learning theory does not treat instrumental conditioning as synonymous with reinforcement. See Chapter 6, pages 160–165.

[10] See Chapter 5, pages 132–133, for a more extensive description of *extinction.*

[11] See Chapter 5, pages 129–130, for further treatment of positive and negative reinforcement and the difference between negative reinforcement and punishment.

PRIMARY REINFORCEMENT. Reinforcement may be either *primary* or *secondary*. Primary reinforcement strengthens a certain behavior through the satisfaction of a basic biological need or drive. Secondary reinforcement sometimes is called high-order reinforcement. The reinforcers of secondary or high-order reinforcement have acquired their power of reinforcement indirectly through learning; poker chips for which a chimpanzee will work and money for which man will do almost anything are secondary reinforcers.

The drive reduction sequence of primary reinforcement proceeds as follows: (1) deprivation of satisfaction of a basic requirement, such as that for food, produces a state of need in an organism; (2) the need expresses itself as a tension state or drive stimulus which energizes the organism into action (a food-deprived animal shows the restless activity whose manifestation is called the hunger drive); (3) the activity achieves satisfaction of the need and relieves the tension state; and (4) the form of the activity which immediately preceded the satisfaction of the need or reduction of the drive is reinforced.

Within a drive reduction sequence, a response is closely associated with a drive stimulus and the stimulus-response conjunction is associated with a rapid decrease in the drive produced stimuli—hunger pangs. Thus the response is reinforced; the tendency for hunger to evoke it is increased. This, supposedly, is how we learn to like our various kinds of food.

SECONDARY REINFORCEMENT. Secondary reinforcement is reinforcement which is brought about by occurrence of an originally neutral stimulus. When a neutral stimulus such as a sound or light is repeatedly paired with food in the presence of a food-deprived (hungry) animal, the formerly neutral stimulus becomes a secondary, conditioned reinforcer. Thus, secondary reinforcement results when originally neutral stimuli become closely associated with primary reinforcing stimuli and thereby become effective in reducing needs. In this way, neutral stimuli acquire the power of acting as reinforcing agents; a chimpanzee learns to accept poker chips as a "reward" just as readily as he accepts food. Consequently, actions of the chimpanzee are reinforced by his receiving poker chips when he performs them; this is secondary reinforcement.

How May We Group S-R Associationists?

On the basis of their position in regard to the associationistic nature of learning, we may divide neobehaviorists into three groups. One group makes conditioning the heart of the learning process, but holds that reinforcement is not necessary for conditioning to occur. A second group is committed to reinforcement or law of effect theories. The third group consists of two-factor theorists who contend that there are two basically different learning processes—conditioning independent of reinforcement and conditioning governed by principles of reinforcement.

Edwin R. Guthrie's *contiguous conditioning* is most representative of the first—conditioning, nonreinforcement—group. The names of Clark L. Hull (1884–1952) and B. F. Skinner are most often associated with the *reinforcement* group. However, Hull and Skinner have differed sharply in regard to the nature of the reinforcement process. Three prominent *two-factor psychologies* are those of Kenneth W. Spence (1907–), Edward C. Tolman (1886–1959), and O. H. Mowrer (1907–). Hence, four representative neobehaviorisms are Guthrie's *contiguous conditioning,* Hull's *deductive behaviorism or reinforcement theory,* Skinner's *operant conditioning,* and Spence's *quantitative S-R theory.* All four are alike in their emphasis upon a mechanical treatment of stimuli and responses. They agree that at no time is purposiveness to be assumed. Problems of "purposes" must be explained by natural laws or principles whereby organisms mechanically develop "purposes." However, they differ in their interpretations of stimulus-response relationships in learning procedures. Guthrie is convinced that learning occurs when a stimulus and a response happen simultaneously; Hull centered the essence of learning in what occurs between the stimulus and the response; and Skinner places his emphasis upon the stimulus which follows a response. When we express these serial relationships symbolically, using S for stimulus, R for response, and O for organism, Guthrie holds to an S-R, Hull to an S-O-R, and Skinner to an R-S learning theory. Since Spence incorporates both contiguity and reinforcement into his theory, it cannot be categorized in this way.[12]

Although there are clear-cut psychological theories of learning, neobehaviorists in education tend not to adhere rigidly to any one of the S-R patterns but to intermix them in applying psychology to teaching procedures. In this way they attempt to achieve an integration of the earlier works of Pavlov, Watson, and Thorndike with that of contemporary S-R associationists. We discuss the position of neobehaviorists in education in more detail in Chapter 11. But let us now examine very briefly three representative, systematic neobehavioristic theories of learning and see how each would color teaching procedures in a school learning situation.

GUTHRIE'S CONTIGUOUS CONDITIONING. Guthrie's learning theory is classical conditioning, not reinforcement. Furthermore, it is a special kind of conditioning which we may identify as *simultaneous contiguous conditioning. Contiguity* means that stimuli acting *at the time* of a response, on their recurrence, tend to evoke that response. Furthermore, if a stimulus occurs contiguously with a response, the response to that stimulus will continue to occur with it until some other response becomes conditioned to that stimulus.

Strengthening of individual connections of stimuli and response —the actual conditioning—supposedly takes place with a single simultaneous occurrence of a stimulus and response. This does not mean that repetition has no place in learning, but that within repetition an increasing number of stimuli are made into conditioners; there is no strengthening of individual connections, but there is enlistment of more.

Guthrie thinks that, since association can occur with one connection and last for life, there is no need for anything like reward, pleasure, or need reduction to explain learning. Thus, there is no place for reinforcement in his contiguity theory. To Guthrie, scientific laws deal with observable phenomena only. In psychology these are physical stimuli, and responses in the form of contractions of muscles and secretions of glands, but there is no place for hypothetical intervening variables between stimuli and responses. We only need to know that ". . . a combination of stimuli which has accompanied a movement will on its recurrence tend to be followed by that movement."[13]

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[12] Chapter 6 contains a description of Spence's learning theory.

A proponent of contiguous conditioning in teaching people first gets them to perform in a certain way, then while they are doing so gives them the stimuli which he wants associated with that behavior. To teach that man is *Homo sapiens,* a Guthriean would induce his student to say *Homo sapiens* and while he was saying it stimulate him with *man* either spelled out, pictured, or both. The more "man" stimuli he could give the student while he was saying *Homo sapiens* the better it would be. In this teaching-learning process *man* is the conditioned stimulus and *Homo sapiens* is the conditioned response.

HULL'S REINFORCEMENT THEORY. Hull's learning theory also is stimulus-response conditioning, but of a special kind, called *reinforcement.* In presenting his theory of learning Hull stated,"*Whenever a reaction* (R) *takes place in temporal contiguity with an afferent receptor impulse* $(\dot{s})$ *resulting from the impact upon a receptor of a stimulus energy* $(\dot{S})$, *and this conjunction is followed closely by the diminution in a need* (*and the associated diminution in the drive,* D, *and in the drive receptor discharge,* s_D), *there will result an increment* $\triangle\ (\dot{s} - - \rightarrow R)$, *in the tendency for that stimulus on subsequent occasions to evoke that reaction.*"[14]

Within Hullian reinforcement, the stimulus and the response are not simultaneous; the stimulus precedes the response. Furthermore, learning does not take place with a single trial; it is stamped in through a process of repeated need or drive stimulus reductions.

Hull thought that learning occurs through biological adaptation of an organism to its environment in a way to promote survival. A state of need means that survival of the organism is not being adequately served. Drive is a general condition of organic privation arising from lack of food, water, or air, from unhealthful temperatures, from tissue injury, from sex-linked conditions, or from other deficiencies. When needs or drive stimuli develop, the organism acts and the action brings reduction in needs or drive stimuli. Actions—responses—which lead to reduction of needs or drive stimuli are reinforced; thus reinforcement is centered in adaptation for survival. However, in life situations there are many reinforcers which do not contribute directly to biological adaptation of an organism. Through higher-order conditioning many things and actions come to have value and can serve as reinforcers. Higher-order conditioning is conditioning based upon previous conditioning; it more often is called secondary conditioning (see page 97 of this chapter).

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[13] Edwin R. Guthrie, *The Psychology of Learning,* rev. ed., Harper & Row, 1952, p. 23.

[14] Clark L. Hull, *Principles of Behavior,* Appleton-Century-Crofts, 1943, p. 71.

A child is conditioned to think—say to himself "man" when he sees a man or a picture of a man. This conditioning could have been based upon reduction of drive stimuli. Perhaps he wanted a piece of candy and his parents withheld it from him until he said "man." Now, in ninth grade, "stimulus man" evokes *Homo sapiens,* perhaps through the satisfaction of curiosity, and curiosity is a product of higher-order conditioning; the youth previously had been conditioned to be curious.

SKINNER'S OPERANT, INSTRUMENTAL CONDITIONING. The unique feature of operant conditioning is that the reinforcing stimulus occurs not simultaneously with or preceding the response but following the response. In operant conditioning, an organism must first make the desired response and then a "reward" is provided. The reward reinforces the response—makes it more likely to recur. The response is instrumental in bringing about its reinforcement. The essence of learning is not stimulus substitution but response modification. In learning, there is a feedback from the reinforcing stimulus to the previous response. To illustrate, in the training of pets a desired response is reinforced after it occurs—a dog is fed after it "speaks," and this increases the likelihood of its "speaking" in the future.

Note that in operant conditioning the stimulus which produced the response in the first place is not in any way involved in the learning process. The original response is a result of a stimulus, but the nature of this stimulation is irrelevant to operant conditioning. It is only necessary that some—any—stimulus elicit the response for operant conditioning to function. Emphasis is on reinforcing agents, not on original causative factors.

An operant-reinforcement approach to teaching a ninth-grader that man is *Homo sapiens* would be to show the student *man* along with several other more complicated words, one of which is *Homo sapiens*. If the student chooses *"non sequitur,"* or any expression other than *Homo sapiens,* nothing happens. If he chooses *"Homo sapiens,"* the teacher says "wonderful." This is reinforcement, and they proceed to a new "problem."[15]

Within neobehaviorism, learning is nonpurposive habit formation. Habits are formed through conditioning, which attaches desired responses to specific stimuli. A stimulus triggers an action or response, which can take only one form because of the nature of the stimulus, the condition of the organism, and the "laws of learning" involved. Teachers who adopt this mechanistic approach to learning decide specifically what behaviors they want their students, when finished products, to manifest, and they proceed to stimulate them in such a way as to evoke and fix those behaviors.

Is Learning Development of Insight?

The key word of Gestalt-field psychologists in describing learning is *insight*. They regard learning as a process of developing new insights or modifying old ones. Insights occur when an individual, in pursuing his purposes, sees new ways of utilizing elements of his environment, including his own bodily structure. The noun *learning* connotes the new insights—or meanings—which are acquired.

Gestalt-field theorists attack two weaknesses in the theory that learning is conditioning: (1) the attempt of S-R associationists to explain complex interrelated organizations in terms of simpler elements, that is, to insist that learning consists of an accumulation of individual conditioned responses, each relatively simple in itself, but eventuating in a complicated pattern of habits; and (2) the tendency of S-R associationists to attribute learning to reduction of basic organic drives.

Gestalt-field psychologists view learning as a purposive, explorative, imaginative, and creative enterprise. This conception breaks completely with the idea that learning consists of linking one thing to another according to certain principles of association. Instead, the learning process is identified with thought or conceptualization; it is a nonmechanical development or change of insight.

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[15] Chapter 5 describes Skinner's learning theory in detail.

S-R associationists also sometimes use the term *insight,* but when they do they mean something quite different from what a Gestalt-field theorist means. When used by associationists, the term describes a special and rare kind of learning. To use Woodworth's definition, insight is ". . . some penetration into the [absolutely] true nature of things."[16] But to Woodworth and other associationists, the ordinary form which learning takes is conditioning. The most systematic of the associationists would deny that there can be two entirely different kinds of learning; therefore they prefer to describe *all* learning as conditioning. Since insight obviously implies something very different from conditioning, many associationists do not use the term at all. To them it connotes something intuitive and mystical, something which cannot be described operationally. In contrast, Gestalt-field psychologists do not like to use the term *conditioning;* they regard *development of insight* as the most descriptive phrase available to describe the manner in which learning actually takes place.

The Gestalt-field definition of insight is a sense of, or feeling for, pattern or relationships. To state it differently, insight is the "sensed way through" or "solution" of a problematic situation. Insights often first appear as vague "hunches." We might say that an insight is a kind of "feel" we get about a situation which permits us to continue actively serving our purposes, or trying to. When are insights verbalized? Perhaps at once; perhaps never. We probably know many things which we never manage to put into words. This is a problem on which animal experimentation sheds some light. Animals below man cannot talk; they can communicate, but not by putting sounds together in coherent subject-predicate sentences. Yet the evidence indicates beyond much doubt that they learn insightfully when confronted with what to them are problems.

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[16] R. S. Woodworth, *Psychology,* Holt, Rinehart and Winston, 1940, pp. 299–300.

If we define *hypothesis* broadly, we may refer to insights as hypotheses. However, a hypothesis usually is defined as a special kind of verbalized insight. It is a statement which takes the form of a declarative sentence, or in many cases an "if-then" sentence. For example, one might say, "Most redheaded girls have violent tempers" (a declarative statement), or one might say, "If most redheaded girls reach a certain frustration level, they then display a violent temper" (an if-then statement). Hypotheses, defined as verbal statements, are the only kind of insight which we can test in a strictly scientific fashion.

This brings us to a crucial question: Are insights necessarily true? Gestalt-field psychologists do not use the term "insights" in a way to imply that they are necessarily true. Granted, the term sometimes is used this way by others—Woodworth, for one (see page 103 of this chapter). But the relativistic orientation of Gestalt-field theorists necessarily leads them to think of insights as trial answers which may or may not help a person toward his goal; they may or may not be true. Truth, relativistically defined, "is that quality of an insight which enables its possessor to design behavior which is successful in that it achieves what it is designed to achieve."[17] Insights derive from a person's best interpretations of what comes to him; they may be deeply discerning or they may not. They may serve as dependable guides for action or they may prove ruinous. Sultan, one of Köhler's chimpanzees, held a box in the air beneath a hanging banana. He then suddenly released his hold on the box and attempted to jump on it to reach the food. Sultan had an insight, but not a true one.

Insights are to be considered, not as literal descriptions of objective physical-social situations, but as interpretations of one's perceived environment on the basis of which subsequent action can be designed. Although insights are not physicalistic descriptions of objects or processes in the environment, they necessarily take account of the physical environment. Their usability depends in part on how well this is done. Insights may misinterpret a physical environment so badly that they are useless as rules of action, in which case they are to be regarded as false.

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[17] Ernest E. Bayles, *Democratic Educational Theory,* Harper & Row, 1960, p. 80.

It is important to understand that insights are always a learner's own. It is true, of course, that they may become his own through adoption. An insight is usable to a learner only if he can "fit it in." He must understand its significance—for him. A teacher cannot give an insight to a student as we serve a person meat on a platter. He may acquaint students with his insights, but they do not become insights for students until students see their meaning for themselves and adopt them as their own.

One objection frequently raised to the Gestalt-field tendency to construe all learning as insightful is that some learning tasks are performed successfully without apparent development of insight—as, for example, when a child memorizes the multiplication tables. A field psychologist concedes that some learning appears highly mechanical, but he goes on to say that it is not necessarily as mechanical as it appears. He argues that even though a child may repeat the multiplication tables until he appears to have memorized them by rote, what the child actually has done is to get the feel of some pattern which is present in the tables. The pattern may lie in the relationship of numbers or perhaps merely in the order in which the student placed the numbers to "memorize" them.

Insight does not imply that for a person to learn something he must understand all aspects of its use. Any degree of "feel for a pattern" is sufficient to constitute insightful learning. For example, in learning to extract the square root of a number, one might develop insight as to *why* the method works. Or the insight gained might be much more superficial; it might be merely a "feel" for the method—the pattern of steps—with no real understanding of the basic algebraic formula $(x + y)^2 = x^2 + 2xy + y^2$.

Some Examples of Insightful Learning

Before he can become a sharpshooter, a rifleman must get a "feel" for his rifle. Often a Tennessee squirrel hunter was slow in learning to be an army rifleman. He had an excellent feel for his squirrel gun, but a squirrel gun was not an army rifle. In his army training he had to change old insights as well as develop new ones. On his squirrel gun his sights were fixed immovably to the barrel. To hit a squirrel he had to take wind and distance into consideration and move the rifle away from a line on the target (windward and upward) to give "Tennessee windage" and "Kentucky elevation." He had developed insights to the point that he could behave intelligently without thinking; he could aim his gun and pull the trigger while giving very little attention to what he was doing.

Since his army rifle had movable sights which, prior to aiming, were to be adjusted to allow for windage and elevation, he was supposed to set his sights and then line them directly on his target. But under pressure of target practice he used his new insights to adjust his sights correctly, then when he began to fire he gave his rifle Tennessee windage and Kentucky elevation. In army terminology he got a "Maggie"—he missed the target completely. He had used two sets of incompatible insights. He could learn to shoot his army rifle accurately only by getting complete feel for his army rifle and leaving most of his squirrel-gun-aiming insights out of the picture.

What is the answer to $\sqrt{(\text{dog})^2} = ?$ How did you know it was "dog"? Had you ever before worked with square root and dog at the same time? If you knew the answer was "dog," you had an insight into the problem. Perhaps you had never put the insight into words, but you knew that $\sqrt{x^2} = x$ and $\sqrt{4^2} = 4$. Your insight, when verbalized, would run something like, "The square root of anything squared is that thing." Conversely, you may have "learned" —memorized—"The square root of a quantity squared is that quantity" and still not know the answer to $\sqrt{(\text{dog})^2} = ?$

How would students study spelling so as to develop insight? Teaching for insight has definite implication for methods in spelling. Groups or families of words might be studied in such a way that students develop feeling for a certain spelling pattern. Once a pattern is discovered other words will be sought which conform to it. *Cat, fat,* and *bat* are "at" words. Now what about *hat, mat, pat, rat,* and *sat?* As students, working cooperatively with their teacher, find other word families, they soon will encounter words which apparently should, but do not, fit a certain family—they find some limitations to an insight. They then seek other words with the same divergence from the "rule" and make a family of them. Or in case there is only one divergent word, they think of it as an exception. As the insights into patterns of spelling are put into words, a class can formulate rules. But now rules will be verbalizations of students' insight as contrasted with meaningless statements memorized at the beginning of study.[18]

Insight and Generalization

Often when an insight is first "caught" it applies to a single case. Even so, a person is likely to assume that the insight may work in similar situations. Suppose, for example, that, after studying a particular situation, we hypothesize, "Mary became a shoplifter because she felt unwanted by her parents." The natural next step is to think, "Boys and girls who feel unwanted at home tend to become thieves." Of course, this generalization is only *suggested.* It is not *warranted* by evidence from a single case. Before generalizations become reliable it is usually necessary that they rest on a number of specific insights, all suggesting the same conclusion. In short, dependable generalizations are usually products of considerable experience. Further, they are prone to change in the course of experience, evolving continuously in the direction of greater usefulness as tools of thought.

A tested generalization is assumed to be valid in any future situation similar to the situations in which it was tested. Tested generalizations have the character of *rules, principles,* or *laws.* Syntactically, generalizations are frequently if-then statements: if we take a given action, then the probability is high that a given consequence will follow. We emphasize that tested generalizations should be regarded as *probabilities.* Although, to behave with foresight, we must assume that our generalizations have predictive value, the predictions are to some degree always based on probability.

As suggested earlier, if-then statements usually also may be expressed in present-tense declarative sentences. For example, when a person says, "An increase in the quantity of money is likely to produce a rise in prices," he may mean exactly the same as if he said, "If the quantity of money in circulation is increased, then prices are likely to rise." In using generalizations as hypotheses in scientific procedure, the if-then form often is preferable. It is more likely than is a simple declarative sentence to suggest operations to be performed, and therefore throw emphasis upon experimental tests.

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[18] Chapters 7 and 8 continue the discussion of the nature of insightful learning and teaching.

WHAT IS THE RELATIONSHIP OF BEHAVIOR TO LEARNING?

Behavioristically defined, "*Behavior* is the publicly observable activity of muscles or glands of external secretion as manifested in movements of parts of the body or in the appearance of tears, sweat, saliva and so forth."[19] Gestalt-field psychology gives "behavior" a quite different meaning. It is any change in a person, his perceived environment, or the relation between the two which is subject to *psychological* principles or laws. Psychological behavior involves purpose and intelligence; hence it is not correlated with physical movement. From a Gestalt-field point of view, psychological behavior is not directly observable; it must be inferred.[20]

Learning and change in observable behavior usually occur side by side and obviously are interrelated in some way. Accordingly, S-R associationists contend that any change of behavior is learning, and conversely, that learning is a change of behavior. Thus, the current practice among many educators of defining learning as "change in behavior" usually reflects an associationist psychology.

Gestalt-field theorists counter that S-R associationists err in making synonymous the observable results of learning and the learning itself. They argue that a change in physiological behavior does not necessarily mean that learning has occurred. A person who is struck from behind and knocked down may gain from this experience a healthy respect for dark alleys, but the change in behavior—falling down—is not equivalent to a change in insight. Furthermore, a person may use insights he has had for some time as a basis for change in his present behavior. An author may know that too much coffee is not good for him but persist in drinking coffee until he completes a manuscript and then reduce the amount of coffee he drinks. Probably many changes in the behavior of school children do not reflect change of insight, or at least not the kind of change which the teacher assumes. Johnny may start saying "please" and "thank you" without an insightful grasp of the implications. He may labor hours every night over homework without having his work produce any change of mind about matters embraced in the homework itself. (Of course, the assignments may cause changes in his attitudes toward teachers and school.)

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[19] D. O. Hebb, *A Textbook of Psychology,* Saunders, 1958, p. 2.

[20] See Morton Deutsch, "Field Theory in Social Psychology," in Gardner Lindzey, Ed., *Handbook of Social Psychology,* Addison-Wesley, 1954, p. 191.

Gestalt-field psychologists maintain that not only may change in behavior occur without learning, but also learning may occur without observable changes in behavior. This is true in any of innumerable situations. There may be no opportunity or occasion for a change in behavior, as when a person decides it would be nice to give more to charity but doesn't have the money to do so. New insights may fail to change a person's behavior if they are competing with old insights which have a stronger hold. Thus, one may decide that racial discrimination is bad but continue to practice it. In summary, when a person learns, his behavior usually changes; but it does not follow that for learning to take place a change in observable behavior must take place at the same time, or that from a change in overt behavior we can always accurately infer the full nature of the insight behind it.

Many people with a behavioristic orientation think that doing something a number of times will necessarily affect future behavior. Thus, if one smokes a pack of cigarettes a day for a few weeks he is likely to become a habitual smoker. Gestalt-field theorists deny that this is the case. Doing a thing once or many times will affect subsequent behavior only in the degree to which doing it gives the doer a feeling for the act or insight into the consequences of its performance. It is the thought process, not the action, which is crucial. For this reason, Gestalt-field psychologists emphasize experience rather than behavior, with experience defined as an interactive event in which a person comes to see and feel the consequences of a given course of action, through acting and seeing what happens.

The emphasis of S-R associationists upon overt behavior has led to school practices designed to produce a desired kind of behavior and to methods of evaluation which measure overt behavior—and nothing else. Teachers, or other school authorities, decide which specific behaviors they want students to display. They then stimulate the students in such a way as to evoke the desired behaviors. The success of the process is judged by how dependably the behavior can be invoked in the future (usually on tests). Field psychologists protest this approach to education; they argue that a student may learn little more from it than the insights he gains about teachers and schools and about how to play the memory-work game successfully.

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CHAPTER 5

How does Skinner's operant conditioning work?

LET EACH OF US picture himself as a fourth grader, Dale Cooper, in a possible classroom of the year 1975. At the first bell students enter the room; at the second bell they become silent. When opening exercises have been completed, the teacher says, "Arithmetic." Dale has been conditioned at this signal to place his arithmetic cylinder on his teaching machine, find where he left off yesterday, and proceed with conditioning himself to solve arithmetic problems. After 20 minutes the teacher says, "Reading," and in another 20 minutes, "Spelling." Each word is the appropriate stimulus for Dale to change cylinders on his machine. Then comes recess. At the sound of a bell with a different tone from that of the one which brought students into the room, they go out to the playground. Here, playground equipment has been adequately mechanized and sequenced so that there is little need for a teacher or any other supervisory personnel. The teacher uses the recess period to check, repair, and lubricate the machines.

The psychology which would support the emphasis on teaching machines for Dale's education has been developed by a professor at Harvard, B. F. Skinner (1904–). Skinner has found *operant conditioning* highly effective in training animals, and he is confident that it promises equal success when used with children and youth. In operant conditioning, teachers are considered architects and builders of students' behavior. Learning objectives are divided in a large number of very small tasks and reinforced one by one. Operants—sets of acts—are reinforced—strengthened—so as to increase the probability of their recurrence in the future. In this process it is of prime importance that teachers employ properly timed and spaced schedules of reinforcement.

Professor Skinner considers it the purpose of psychology to predict and control *behavior* of individual organisms. He insists upon limiting psychological study to observable behavior of organisms; his only data are those acquired by sensory observation. He opposes the use by psychologists or teachers of such terms as "will power," "sensation," "image," "drive," or "instinct"; these refer to supposedly nonphysical events. Behavior is ". . . the movement of an organism or of its parts in a frame of reference provided by the organism itself or by various external objects or fields of force."[1]

Skinner's psychology is a strictly engineering type of science which supposedly is devoid of theory of any kind. He insists that psychology is a science of overt behavior and only overt behavior. He defines learning as a change in probability of response. In most cases this change is brought about by operant conditioning.

Operant conditioning is the learning process whereby a response is made more probable or more frequent; an *operant* is strengthened—reinforced. Reinforcement is explained in Chapter 4, p. 96. An operant is a set of acts which constitutes an organism's doing something—raising its head, pushing a lever, saying "horse." In the process of operant conditioning, operant responses are modified or changed. Reinforcement means that the probability of the repetition of certain responses is increased.

Skinner thinks that nearly all human behavior is a product of operant reinforcement. In everyday life, in various fields including education, people constantly change the probabilities of responses of others by arranging reinforcing consequences. Operant reinforcement improves the efficiency of behavior. Through it we learn to keep our balance, walk, play games, and handle tools and instruments; we perform a set of motions, reinforcement occurs, and the likelihood of our repeating the motions is increased.

Whenever something reinforces a particular form of behavior, the chances are better that that behavior will be repeated. The task of psychologists is to gain more understanding of conditions under which reinforcement works best. To the many "natural" reinforcers of behavior, a host of artificial reinforcers may be added. "Any list of values is a list of reinforcers—conditioned or otherwise. We are so constituted that under certain circumstances food, water, sexual contact, and so on, will make any behavior which produces them more likely to occur again. Other things may acquire this power. . . . An organism can be reinforced by—can be made to 'choose' —almost any given state of affairs."[2]

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[1] B. F. Skinner, *The Behavior of Organisms,* Appleton-Century-Crofts, 1938, p. 6.

HOW HAS SKINNER USED ANIMALS TO STUDY OPERANT REINFORCEMENT?

In general, experimental psychologists have not related their laws and theories to instances of learning in real life.[3] However, Professor Skinner and his associates have experienced remarkable success in training animals. It is probable that even professional animal trainers, through study of the procedures used in operant conditioning, could improve their techniques. In one college class period, by presenting food to a hungry pigeon at the right time, Skinner has implanted in the bird three or four well-defined responses such as turning around, pacing the floor in a figure-eight pattern, stretching the neck, and stamping the foot.

Skinner's basic thesis is that, since an organism tends in the future to do what it was doing at the time of reinforcement, one can, by baiting each step of the way, lead it to do very much what the experimenter wishes it to do. Using this thesis as a basis for his procedure, he has taught rats to use a marble to obtain food from a vending machine, pigeons to play a modified game of tennis, and dogs to operate the pedal of a refuse can so as to retrieve a bone.

Skinner has centered his study on lower animals because their behavior is simpler, conditions surrounding them may be controlled better, basic processes are revealed more readily and can be recorded over longer periods of time, and observations are not complicated by social relations between subjects and the psychologist.[4]

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[2] B. F. Skinner, *Cumulative Record,* Appleton-Century-Crofts, 1959, p. 33.

[3] See Donald K. Adams *et al., Learning Theory, Personality Theory, and Clinical Research,* Wiley, 1954, p. 2.

The "Skinner box" is a simple box which was made to contain a rat, a lever, and a device for delivering a pellet of food each time the rat pressed the lever. Recording devices are set outside the box so that the experimenter can go home at night and see in the morning what the rat has been doing. There also are Skinner boxes for the study of pigeons and other animals. A rat or pigeon learns rapidly in a Skinner box because in the box there is little else for him to do. Skinner says, "The barest possible statement of the process is this: we make a given consequence contingent [dependent] upon certain physical properties of behavior (the upward movement of the head), and the behavior is then observed to increase in frequency."[5]

A pigeon's behavior can be reinforced in such a way that neck stretching will become habitual. The pigeon is placed in a cage so that the experimenter can sight across its head at a scale pinned on the far wall of the cage. The height at which the head is normally held is established on the scale; then some line, which is reached only infrequently, is selected. The experimenter, keeping his eye on the scale, quickly opens the food tray whenever the bird's head rises above the established line. As a result, learning occurs; ". . . we observe an immediate change in the frequency with which the head crosses the line. We also observe, and this is of some importance theoretically, that higher lines are now being crossed. We may advance almost immediately to a higher line in determining when food is to be presented. In a minute or two, the bird's posture has changed so that the top of the head seldom falls below the line which we first choose."[6]

By training two pigeons separately to do their parts in a total performance, Skinner has constructed a social scene within which competition is exemplified by two pigeons playing a modified game of ping-pong. He accomplished the training through operant reinforcement. First, the pigeons were reinforced when they merely pushed the ball. Then when the ball got by one pigeon the other was reinforced. He also has trained pigeons to coordinate their behavior in dancing in a cooperative manner which rivals the skills of most able human dancers.

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[4] B. F. Skinner, *Science and Human Behavior,* Macmillan, 1953, p. 38.

[5] *Ibid.,* p. 64.

[6] *Ibid.,* pp. 63–64.

Reinforcement procedures may vary according to intervals of time and the number of responses between reinforcements. A schedule of reinforcement is a pattern of "rewarding" behavior based upon a fixed time interval and a fixed number of responses between "rewards." In a laboratory, Skinner and Ferster have obtained performances appropriate to each of nine different ratio-interval schedules. When a stimulus is presented the pigeon executes the performance appropriate to its reinforcement schedule. Then when another stimulus is presented, the pigeon executes the performance appropriate to its specific schedule. Skinner thinks that this achievement makes more plausible the extension of laboratory results to daily life. To him learning, in the everyday life of people, is more complicated but nevertheless of the same basic nature as an animal's learning through operant conditioning.[7]

In operant conditioning experiments, the species of organism studied has made surprisingly little difference. "Comparable results have been obtained with pigeons, rats, dogs, monkeys, human children, and most recently, . . . human psychotic subjects. In spite of great phylogenetic differences, all these organisms show amazingly similar properties of the learning process."[8]

WHAT PSYCHOLOGICAL THEORY UNDERLIES SKINNER'S TEACHING PROCEDURES?

Throughout his study and writings, Professor Skinner has adhered rigorously to a basic conviction that psychologists should restrict their study to the correlations between stimuli and responses and not meddle with any "make-believe" psychology which constructs intervening physiological or mental links between stimuli and responses. Adherents of Skinner's position consider study of these intervening variables ". . . a dummy physiology doing duty for truth when facts are missing."[9]

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[7] See Skinner, *Cumulative Record,* pp. 147–148.

[8] *Ibid.,* p. 148.

In a sense Skinner's psychology, operant behaviorism, is a modern extension of the earlier stimulus-response psychologies—connectionism as developed by Thorndike and behaviorism as developed by Watson. Thorndike dealt with both physical and mental elements but was always mechanistic in his study of man. Watson, too, was mechanistic; however, he limited his study to the behavior of biological organisms. Skinner, like both Thorndike and Watson, assumes that man is neutral and passive and that all behavior can be described in mechanistic terms. In his study of man and animals, he constantly is mechanistic, elementistic, and associationistic; to him, psychology is the *science of behavior.*

What Is the Meaning of the "Science of Behavior"?

Skinner sees a great and crucial future for a science of behavior. In his view, since a science of behavior is concerned with demonstrating the consequences of cultural practices, there is reason to believe that presence of such a science will be an essential mark of the culture or cultures which will survive in the future, and that the culture most likely to survive is the one in which the methods of science are most effectively applied to the problems of human behavior.[10] Consequently, throughout his work he has striven constantly to be scientific to the nth degree. He sees "science" as ". . . more than a set of attitudes. It is a search for order, for uniformities, for lawful relations among the events in nature. It begins, as we all begin, by observing single episodes, but it quickly passes on to the general rule, to scientific law."[11] Thus, he places himself in line as a contemporary representative of inductive, atomistic science following the earlier pattern of Francis Bacon and John Stuart Mill. One can get the "flavor" of Skinner's work only through reading his books and papers. His frequent usage of the definite article *the* as contrasted with his infrequent usage of the indefinite articles *a* or *an* is quickly apparent. Like other "realistic" scientists, he assumes that this practice adds to objectivity and makes reports of studies more "scientific."

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[9] Edwin G. Boring, *A History of Experimental Psychology,* Appleton-Century-Crofts, 1950, p. 650.

[10] Skinner, *Science and Human Behavior,* p. 446.

[11] *Ibid.,* p. 13.

A "REALISTIC" DEFINITION OF SCIENCE. Skinner works on the basic assumption that there is order in nature, including human behavior, and that it is the function of science to *discover* the order; this is the commitment of a realistic, as opposed to a relativistic, scientist.[12] Within Skinner's realistic outlook, science is concerned with discovery of pre-existent laws which govern the world about us. Knowledge of these laws enhances predictability, and thereby control, of the variables which cause events to occur. This supposedly is as true in psychology as in physics or chemistry. Thus, man, through discovery of laws and organization of them into systems, enables himself to deal effectively with aspects of the naturalistic world.

Skinner recognizes that ". . . it is time to insist that science does not progress by carefully designed steps called 'experiments' each of which has a well-defined beginning and end. Science is a continuous and often a disorderly and accidental process."[13] Nevertheless he leaves unrecognized the relativistic principle that "reality" consists of that which we make of what comes to us and is ". . . definable as something which might, should, or does make a difference to someone or something."[14]

MAN, A SUBJECT OF SCIENCE. According to Skinner, it is not to be assumed that human behavior has any peculiar properties which require a unique method or special kind of knowledge. The variables of psychology, like the variables of any other science, must be described in physical terms. In Skinner's psychology, the dependent variable in a situation is the behavior of an individual organism. The independent variable consists of external conditions of which the behavior is a function. This means that behavior operates upon the environment to generate consequences; *it* behaves.

The laws of the science of psychology are as definite as those of any other science. Skinner says, "It is decidedly not true that a horse may be led to water but cannot be made to drink."[15] He thinks that, through applying the laws of psychology and arranging a history of severe deprivation, it could be made absolutely sure that drinking would occur; likewise, a desired behavior can be caused in a human being.

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[12] Skinner, *Cumulative Record,* pp. 88–89.

[13] *Ibid.,* p. 98.

[14] Ernest E. Bayles, *Democratic Educational Theory,* Harper & Row, 1960, p. 94.

Skinner's goal in psychology is to achieve the degree of prediction and control in regard to human behavior that has been achieved by the physical sciences. The scientist of behavior evaluates probability of behavior and explores conditions that determine it. Through gathering data in regard to the frequencies of responses which have already occurred, he is able to make accurate statements about the likelihood of occurrence of a single future response of the same kind; frequency of response indicates probability of response. "We are concerned, then, with the causes of human behavior. We want to know why men behave as they do. Any condition or event which can be shown to have an effect upon behavior must be taken into account. By discovering and analyzing these causes, we can predict behavior; to the extent that we can manipulate them, we can control behavior."[16]

The problem of predicting whether a man will commit suicide is of the same nature as the problem of predicting the probability of explosion of the first atomic bomb. The basic datum in scientific analysis of behavior is probability. However, the actual observed dependent variable is frequency of response. Since much important human behavior occurs only once, it cannot be studied in terms of frequencies. A man may marry only once, he may engage in a business deal only once—he will commit suicide only once. So, like the probability of the first atomic bomb explosion, some behavior cannot be stated in terms of frequency. Nevertheless, it can be evaluated in terms of probabilities of many of the component events which can be based upon data in the form of frequencies, and any behavior may be studied in terms of its component parts.[17]

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[15] Skinner, *Science and Human Behavior,* p. 32.

[16] *Ibid.,* p. 23.

[17] Skinner, *Cumulative Record,* p. 76.

How Is the Science of Behavior Related to Determinism?

Skinner's psychology implies a strictly naturalistic determinism. He notes that a scientific conception of human behavior dictates one practice and a philosophy of personal freedom another; and that a scientific conception of human behavior entails the acceptance of an assumption of determinism. Determinism means that behavior is caused, and that the behavior which appears is the only kind which could have appeared. Skinner emphasizes that the same type of determinism which is commonly accepted as applying to machines applies equally to human beings. As machines have become more lifelike, living organisms have been found to be more like machines. Today, many machines are deliberately designed to operate in ways which resemble "human behavior." "Man has, in short, created the machine in his own image."[18] Since mechanical calculators now solve equations too difficult or too time-consuming even for human mathematicians, human beings have lost much of their uniqueness.

Determinism carries with it the implication that environment determines an individual even when he alters his own environment. "It does not matter that the individual may take it upon himself to control the variables of which his own behavior is a function or, in a broad sense, to engage in the design of his own culture. He does this only because he is the product of a culture which generates self-control or cultural design as a mode of behavior."[19]

Skinner says, "The scientist, like any organism, is the product of a unique history."[20] He considers science of major importance in human affairs, but recognizes that even scientists and science are not free. Science, too, is a part of a naturally determined course of events, and it cannot interfere with that course. Thus, science and scientists must be included in any adequate account which science gives of human behavior in general. Science supplies an account of processes of which it itself is an example.[21]

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[18] Skinner, *Science and Human Behavior,* p. 46.

[19] *Ibid.,* p. 448.

[20] Skinner, *Cumulative Record,* p. 99.

[21] Skinner, *Science and Human Behavior,* p. 446.

HOW IS OPERANT CONDITIONING NONPHYSIOLOGICAL AND NONPHENOMENOLOGICAL?

A system of operant conditioning has no place for study of either physiological or phenomenological psychology. *Physiological psychology* is devoted to study of physiological, neurological, and biological functions within an organism. *Phenomenological psychology* centers upon what events mean to the persons involved. In a sense it is similar to physiological psychology in that it, too, is centered upon what takes place within a person. However, it differs sharply from physiological psychology in that major emphasis is placed upon the process of experiencing. Because Skinner rejects both physiological and phenomenological psychology, his friends sometimes speak of his dealing with the "empty organism."

NONPHYSIOLOGICAL PSYCHOLOGY. Skinner is convinced that the practice of looking inside an organism for an explanation of behavior has tended to obscure the variables which lie outside the organism and are immediately available for scientific analysis. These variables outside the organism are in its environmental history and its immediate environment. Their study permits behavior to be explained scientifically just as behavior of nonliving objects is explained scientifically by physicists. These independent variables are of many sorts and their relation to behavior is often subtle and complex; nevertheless, according to Skinner, it is only through analyzing them that we may hope to reach an adequate account of behavior.

Since not all statements about the nervous system are expressed in the same terms and cannot be confirmed by the same method of observation as the facts for which they are supposed to account, they are theories. Thus, Skinner feels that they can make little contribution to a scientific psychology. In the present stage of science a neurological explanation of behavior is impossible. However, this fact in no way implies that a scientific psychology of learning cannot be established separate from any neurological theory.

NONPHENOMENOLOGICAL PSYCHOLOGY. Statements about mental events, like neurological statements, also are theoretical. Thus, Skinner belittles attempts of psychologists to infer what a physical situation *means* to an organism or to distinguish between the physical world and the psychological world of experience. He constantly emphasizes that events affecting an organism must be capable of being described in the language of physical science.[22] To him, the "free inner man" who is held responsible for the behavior of the external biological organism is only a prescientific substitute for the kinds of external causes of behavior which are susceptible to scientific analysis. Hence there is no place in scientific psychology for study of the personal experience of a man.

Skinner sees the practice of some scientists, who indicate that they are describing only half the universe and that there is another half—a world of self, mind, or consciousness—as a part of the cultural heritage from which science has emerged but which now stands in the way of a unified scientific account of nature. Even in discussing the higher human function, thinking, Skinner sees little need for the concept *self*. He recognizes that behavior is a function of the environment, that environment, then, presumably means any event in the universe capable of affecting the organism, and that a very small part of this universe is private—it is enclosed within the organism's own skin. Thus, some independent variables, for example, an aching tooth, may be related to behavior in a unique way. However, he sees no reason to suppose that the stimulating effect of an inflamed tooth is essentially different from that of a hot stove.[23]

Since the self is not identical with the physical organism, such a concept is not essential in any analysis of behavior. The concept may have had an early advantage in representing a relatively coherent response system, but it is hazardous in that it may lead us to expect consistencies and functional integrities which do not exist. "The alternative to the use of the concept [self] is simply to deal with demonstrated covariations in the strength of responses."[24]

In opposing the "inner man" concept of human behavior, Skinner notes the similarity of the inner man concept to a "God within" which does not occupy space and thus may be multiplied at will, as is done in the Freudian pattern. He points out that as more and more of the behavior of organisms has come to be explained in terms of stimuli, at each stage of scientific development of psychology, some part of the control of the organism has passed from a hypothetical inner entity to the external environment. "The 'will' has retreated up the spinal cord, through the lower and then the higher parts of the brain, and finally, with the conditioned reflex, has escaped through the front of the head."[25]

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[22] *Ibid.*, p. 36.

[23] *Ibid.*, p. 258.

[24] *Ibid.*, p. 286.

In Skinner's system there is no place for the statement that behavior is under the control of an incentive or goal. A scientific psychology, as Skinner defines it, replaces statements which might use such words as "incentive," "goal," or "purpose" with statements about conditioning. Instead of saying that a man behaves because of the consequences which are to follow his behavior, we simply state that he behaves thus and so because of the consequences which have followed similar behavior in the past. When one is "looking for something" he is emitting responses which in the past produced something as a consequence. When one says, "I am looking for my glasses," what he really means is ". . . 'I have lost my glasses,' 'I shall stop what I am doing when I find my glasses,' or 'When I have done this in the past, I have found my glasses.' "[26]

Since the terms *pleasant* and *satisfying* do not refer to any physical property of reinforcing events, and physical sciences use neither of these terms nor their equivalents, they, too, should be deleted from the language of a science of psychology. Furthermore, since behavior is always the behavior of an individual, a science of behavior which concerns only the behavior of groups is not likely to be of help in understanding particular cases. Thus, "A 'social force' is no more useful in manipulating behavior than an inner state of hunger, anxiety, or skepticism."[27]

WHAT IS THE NATURE OF OPERANT CONDITIONING OR REINFORCEMENT?

In the pigeon experiment, the process of *operant conditioning* is the change in frequency with which the head is lifted to a given height, the *reinforcer* is food, and the *reinforcement* is food presentation when the response is emitted. The *operant* is the behavior upon which the reinforcement is contingent—the height to which the head must be raised.

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[25] *Ibid.*, pp. 48–49.

[26] *Ibid.*, p. 90.

[27] *Ibid.*, p. 36.

In operant conditioning, the important stimulus is the one immediately following the response, not the one preceding it. Any emitted response which leads to reinforcement is thereby strengthened. It is not the specific response—R that is strengthened, but rather the *general tendency* to make the response. A rat presses a lever and gets food. Because of this, the rat will be more likely to press the lever again. "What is changed is the future probability of response in the same *class*."[28] The operant as a class of behavior, rather than the response as a particular instance, is reinforced. Since each reinforcement builds up a reserve of responses, a pigeon may continue to raise its head or a rat to press the lever several, or even many, times after food has ceased to appear.

The law of operant conditioning is that, if the occurrence of an operant is followed by presentation of a reinforcing stimulus, the strength—probability—is increased. What is strengthened is not a stimulus-response connection; the operant requires no specific eliciting stimulus. Insofar as the organism is concerned, the only important property of the operant contingency is time; the reinforcer follows the response. How this is brought about does not matter. The process of operant conditioning may be described adequately without any mention of a stimulus which acts before the response is made. In reinforcing a pigeon's neck stretching, it is necessary only for one to wait for neck stretching to occur. It is not necessary for the experimenter to elicit it.

In operant conditioning, the subject's seeing a connection is in no way essential. Skinner considers Thorndike's expression "trial and error learning" to be superfluous and out of place. As he has observed the behavior of pigeons and other animals, he has seen no reason to call the movements being taught "trials" and any movements which did not achieve a specified consequence "errors." "The statement that the bird 'learns that it will get food by stretching its neck' is an inaccurate report of what has happened."[29] A Gestalt-field explanation of how the bird learns, of course, would be just this.

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[28] *Ibid.*, p. 87.

Skinner observes that the behavior which is more likely to be reinforced is the more likely to occur. Presence of a cat is the occasion upon which the response "cat" is likely to be reinforced. However, a stimulus eliciting "cat" is in no way an essential part of the operant conditioning process. Operant reinforcement of a behavior is contingent—dependent—upon a response, not the stimulus which gave rise to that response. The response *c-a-t* is reinforced after it is uttered. The stimulus involved here is a discriminative, not an eliciting, one. "The discriminative stimulus does not elicit a response, it simply alters a probability of occurrence."[30] It is not correct to say that an operant reinforcement strengthened the response which preceded it; the response has already occurred and cannot be changed. What has been changed is that the probability that that class of responses will occur in the future has been increased.

Skinner revised Thorndike's law of effect. "Instead of saying that a man behaves because of the consequences which *are* to follow his behavior, we simply say that he behaves because of the consequences which *have* followed similar behavior in the past. This is, of course, the Law of Effect or operant conditioning."[31] The law of effect exemplified in operant conditioning simply specifies a procedure for altering the probability of a chosen response. By progressively changing the *contingencies of reinforcement* in the direction of the desired behavior, one can see learning occur.

What Are Contingencies of Reinforcement?

A contingency of reinforcement is a sequence in which a response is followed by a reinforcing stimulus. The basic three-term contingency of operant conditioning is response, stimulus, and reinforcement, in that order. In a contingency the occurrence of an operant—response—is *followed by* presentation of a reinforcing stimulus, and the strength—probability—of recurrence of the op-

[29] *Ibid.*, p. 64.
[30] *Ibid.*, p. 110.
[31] *Ibid.*, p. 87.

erant is increased. The three-term contingency of operant reinforcement occurs when a child is taught to read; a given response is reinforced with "Right" or "Wrong" according to how the student responds to the appropriate visual stimulus—word or sentence.

The key to successful teaching or training is to analyze the effect of reinforcement and design techniques which manipulate the process with considerable precision—to set up specific reinforcing contingencies. In this way the behavior of an individual organism may be brought under precise control. Implicit in operant behaviorism is the conviction that "When all relevant variables have been arranged, an organism will or will not respond. If it does not, it cannot. If it can, it will."[32]

How Does Operant Differ from Respondent or Reflexive Conditioning?

Reflexive learning involves such situations as are described in the Pavlovian dog studies. Essentially it is a process of stimulus substitution. An organism supposedly responds reflexively to a natural or unconditioned stimulus. A new stimulus is presented along with the original stimulus and the organism comes to respond to the new stimulus in the same way it formerly did to the original one. The new stimulus becomes a conditioned stimulus; the organism has learned. In reflexive or respondent conditioning the key stimulus is the one which precedes the response. Whereas reflexive learning is an S-R process, operant learning is an R-S process.

In operant learning, the significant stimulus is that which immediately follows the response. Any modification of the environment is a stimulus. Operant behavior is that behavior which operates upon the environment to generate consequences. Notice that in this process not the person or the environment but it—behavior—behaves; behavior is a phenomenon of nature. Just as wind blows, behavior behaves.

Although Skinner acknowledges two kinds of learning—operant and reflexive—he places far greater emphasis upon operant learning, which is under the control of its consequences. He sees most human behavior and consequently nearly all human conditioning or learning as operant. He feels that, if all the behavior which falls into the pattern of simple reflexes were assembled, it would represent only a very small fraction of the total behavior of an organism. He is convinced that early investigators overworked the principle of reflexive conditioning and made exaggerated claims for it. However, he warns that the area of reflex behavior should not be overlooked. To ignore completely the principle of the conditioned reflex would be unwarranted. But "It is neither plausible nor expedient to conceive of the organism as a complicated jack-in-the-box with a long list of tricks, each of which may be evoked by pressing the proper button. The greater part of the behavior of the intact organism is not under this primitive sort of stimulus control. The environment affects the organism in many ways which are not conveniently classed as 'stimuli,' and even in the field of stimulation only a small part of the forces acting upon the organism elicit responses in the invariable manner of reflex action."[33] The environment is so constructed that certain things tend to happen together. Respondent conditioning is the effect of this phenomenon upon behavior. When certain events like the color and taste of ripe fruit occur together, an organism responds in the same manner to either stimulus, color or taste. It has learned this through respondent conditioning. However, the importance of this kind of learning has been emphasized far too much. Behavior such as eating a meal or driving a car shows but little respondent character; most of it is operant in nature.

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[32] *Ibid.*, p. 112.

WHAT ARE THE PROCESSES OF OPERANT REINFORCEMENT AND EXTINCTION?

In operant conditioning, an operant is strengthened through its *reinforcement* or weakened through its *extinction.* The psychologist's task is simply to account for probability of responses in terms of a history of reinforcement and extinction. The effect of *reinforcement* always is to increase the probability of response. Extinction is the reverse of reinforcement. When a reinforcing stimulus no longer occurs following a response, the response becomes less and less frequent; this is operant *extinction*. "Conditioning builds up a predisposition to respond—a 'reserve'—which extinction exhausts."[34]

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[33] *Ibid.,* pp. 49–50.

What Are the Two Kinds of Reinforcers?

Any stimulus whose presentation or removal increases the probability of a response is a reinforcer. Consequently, there are two kinds of reinforcers or reinforcing events—positive and negative. A positive reinforcer is any stimulus the *presentation* of which strengthens the behavior upon which it is made contingent; a negative reinforcer is any stimulus the *withdrawal* of which strengthens that behavior. Since in both cases responses are strengthened, reinforcement is taking place. A positive reinforcement consists of presenting a stimulus, of adding something—food, water, or a teacher's smile—to an organism's environment. A negative reinforcement consists of removing something—a loud noise, an electric shock, or a teacher's frown—from the situation. In both of these cases the probability that the response will recur is increased.

Although in lay usage both positive and negative reinforcers are "rewards," Skinner warns against defining a positive reinforcer as pleasant or satisfying and a negative reinforcer as annoying. "It would be as difficult to show that the reinforcing power of an aversion stimulus is due to its unpleasantness as to show that the reinforcing power of a positive reinforcer is due to its pleasantness."[35] When a person reports that an event is pleasant, this simply means that the event is of such kind that it reinforces him. Physical science uses no such terms as "pleasant" and "unpleasant" or their equivalents. The terms in no way refer to physical properties of reinforcing agents.

Is Punishment Reinforcement?

Punishment is a basically different process from reinforcement. Whereas reinforcement involves presentation of a positive reinforcer or removal of a negative one, punishment consists of presentation of a negative stimulus or removal of a positive one. Again, whereas reinforcement is defined in terms of strengthening of a response, punishment supposedly is a process which weakens a response. Putting it succinctly, when a stimulus is involved in strengthening a response there is reinforcement; when a stimulus is presented or withdrawn in an attempt to weaken a response, there is punishment.

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[34] Skinner, *Cumulative Record*, p. 53.

[35] Skinner, *Science and Human Behavior*, p. 173.

Results of experiments indicate that punishment does not permanently reduce a tendency to respond. Thorndike's experiments with human subjects indicated that a reward strengthened the behavior which preceded it but that punishment did not weaken it. Through reward, behavior may be stamped in; but the converse, that through punishment it can be stamped out, does not hold. Whereas reinforcement can be controlled to good advantage, in the long run punishment works to the disadvantage of both the punished organism and the punishing agency. Its results are neither predictable nor dependable. Extinction—permitting a behavior to die out by not reinforcing it—and not punishment is the appropriate process for breaking habits.

What Are the Types of Operant Reinforcement?

There are two rather distinct types of operant reinforcement—stimulus discrimination and response differentiation. Nearly all human learning can be classified under these two. However, the process of respondent (reflexive) conditioning must not be completely ignored.

Through operant reinforcement a relatively complete new unit of behavior may be learned or an existing unit of behavior may be refined. In general, reinforcement which leads to behavior acquirement is a process of discrimination of stimuli, whereas behavior refinement or skill development is a process of differentiation of response.

DISCRIMINATION OF STIMULI. Operant discrimination is a change in behavior as the result of changes in the environment—stimuli—of the organism. A pigeon can be made to be more likely to respond by stretching its neck at times when a light is on. This probability is increased by discrimination. Imitative behavior is an example of the result of discriminative operant reinforcement. Such behavior does not arise because of any inherent reflex mechanism but develops in the history of the individual as a result of discriminative reinforcements. The visual stimulation of someone's waving a hand is the occasion upon which waving a hand probably received reinforcement. The reinforcement, not the stimulation from the other person's waving his hand, is the cause of future hand waving in similar situations. Because objects in shop windows into which other people are looking are likely to reinforce looking into such windows, when a person sees other people looking into a shop window he too is likely to look. Taking an interest or attending are only some other expressions that are commonly used to describe the consequence of discriminative operant reinforcement. "Attention is a controlling *relation*—the relation between a response and a discriminative stimulus. When someone is paying attention he is under special control of a stimulus."[36]

DIFFERENTIATION OF RESPONSE. Skills are improved through differences in reinforcements of varying responses. Many differentiation reinforcements may be supplied automatically by mechanical exigencies of the environment of an organism. To throw a ball skillfully, a person must release it at the proper moment; instances in which release comes before or after the proper moment are not reinforced. However, in more complex skill learning, reinforcement must be supplied by a teacher. In this process, reinforcement which develops skill must be immediate. "By reinforcing a series of successive approximations, we bring a rare response to a very high probability in a short time."[37]

Through the procedure of operant conditioning, within which differentiation of response is reinforced, a hungry pigeon well adapted to the experimental situation and the food tray usually can be brought to respond by pecking a specific spot in two or three minutes. To get the pigeon to peck a specific spot as quickly as possible, the bird is given food when it turns slightly in the direction of the spot. This increases the frequency of turning toward the spot. Reinforcement is then withheld until the bird makes a slight movement toward the spot. Then positions which are successively closer to the spot are reinforced. Then reinforcement is given only when the head is moved slightly forward, and finally only when the beak actually makes contact with the spot.

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[36] *Ibid.*, p. 123.

[37] *Ibid.*, p. 92.

In target practice a rifleman needs a report of the accuracy of the shot from time to time to maintain the reinforcing power of feedback. However, after some practice he eventually knows before the target is hit whether the shot was good or bad. His own behavior generates a stimulating feedback. Hits and misses generate different forms of this feedback. Likewise, good form in bowling is reinforced by feedback from the bowler's body.

What Is Extinction?

We know that, in general, when we engage in behavior which no longer "pays off," we find ourselves less inclined to behave in that way again. If we get no answers to telephone calls, we eventually stop telephoning. In operant behaviorism this phenomenon would be described by saying that when reinforcement is no longer forthcoming, a response becomes less and less frequent. This is the process of operant extinction.

Operant extinction takes place much more slowly than does operant reinforcement. However, as an organism responds less and less, a uniform process of extinction may be detected. Since behavior during extinction is a result of the conditioning which had preceded it, extinction occurs quickly when only a few of a given response have been reinforced and is greatly protracted when there has been a long history of reinforcement.

The extinction process includes the interesting phenomenon of spontaneous recovery. Even after prolonged extinction, an organism, at the beginning of another session of an activity in which it had been trained but now is no longer being reinforced, often will respond at a higher rate for at least a few moments.

Sometimes an extinction curve is disturbed by an emotional effect. Failure of a response to be reinforced not only leads to operant extinction but also may be accompanied by a reaction commonly called frustration or rage. A pigeon that has failed to receive reinforcement flaps its wings and engages in other emotional behavior. A mechanic, who is in the habit of having bolts unscrew when he turns his wrench, vents his spleen when one breaks off instead. However, after exercising his vocabulary he turns back to the next bolt. Likewise a pigeon or rat will turn again to the operating key of the box when the emotional response has subsided. Extinction curves often show cyclic oscillation as the emotional response builds up, disappears, and builds up again.

Whereas the mere passage of time after reinforcement has surprisingly little effect upon loss of the act or habit, extinction is an effective way of removing an operant from the reportoire of an organism. When unaccompanied by extinction, forgetting takes place very slowly if at all. Note the key difference here: Whereas mere forgetting is the losing of a habit through the passage of time, extinction requires that the response be emitted without reinforcement. "In human behavior skilled responses generated by relatively precise contingencies frequently survive unused for as much as half a lifetime."[38] The commonly heard assertion that early experiences of a child determine the personality of the mature person implies that the effect of operant reinforcement is very durable and that in human beings operant extinction is unlikely to occur on a large scale.

The resistance to extinction generated by intermittent reinforcement of a response is much greater than that achieved by the same number of reinforcements given for consecutive responses. If we only occasionally reinforce a child's good behavior, the behavior survives after reinforcement is discontinued much longer than if we had reinforced every instance up to the same total number of reinforcements. Since intermittent reinforcement generates longer extinction curves than does continuous reinforcement, there is no simple relation between the number of reinforcements and the number of unreinforced responses necessary for extinction.

HOW MAY OPERANT CONDITIONING BE APPLIED TO SCHOOLROOM PRACTICES?

Skinner is convinced that operant conditioning, so fruitful when applied to animal training, promises equal success when used in schools. He feels that the most efficient control of human learning requires instrumental aid. He is appalled at the present inefficient practices in schools and recommends a procedure whereby they can be corrected. He recognizes the *first* task of teachers to be to shape proper responses, to get children to pronounce and write responses properly. But he sees their *principal* task as bringing proper behavior under many sorts of stimulus control. "Teaching spelling is mainly a process of shaping complex forms of behavior. In other subjects—for example, arithmetic—responses must be brought under the control of appropriate stimuli."[39] To achieve this task, Skinner recommends the use of programed learning.

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[38] *Ibid.*, p. 71.

Programed instruction is a system of teaching and learning within which pre-established subject matter is broken down into small, discrete steps and carefully organized into a logical sequence in which it can be learned readily by the students. Each step builds deliberately upon the preceding one. The learner can progress through the sequence of steps at his own rate and he is reinforced immediately after each step; either he is given the correct response or he is permitted to proceed to the next step after he registers the correct response. Programed instruction may be accomplished with or without the use of teaching machines. (A teaching machine is described on page 139.)

What Are the Shortcomings of Current Educational Practice?

Skinner believes that it is in bringing correct responses under stimulus control that the greatest inefficiency of current teaching procedures occurs. "In education we design and re-design our curricula in a desperate attempt to provide a liberal education while steadfastly refusing to employ available engineering techniques which would efficiently build the interests and instill the knowledge which are the goals of education."[40] Consequently he notes some current weaknesses in educational practices: (1) behavior is dominated by aversion (escape) stimulation; (2) too great a lapse of time exists between behavior and its reinforcement; (3) a skillful program of reinforcement which moves forward through a series of progressive approximations to the final complex behavior desired is lacking; and (4) reinforcement of desired behavior occurs much too infrequently.

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[39] Skinner, *Cumulative Record,* p. 165.

[40] *Ibid.,* p. 228.

BEHAVIOR DOMINATED BY AVERSION STIMULATION. Although the type of threatened displeasure or pain has been changed in the past fifty years, behavior in the lower grades is still dominated by aversive stimulation—a child is trying to escape or keep away from something. Fifty years ago a child read numbers, copied numbers, and memorized tables to escape the birch rod or cane, that is, as far as the child was concerned, he did these things to avoid or escape punishment. Today a school child behaves the way he does primarily to escape the threat of a series of minor distasteful events —the teacher's displeasure, criticism or ridicule by his classmates, a poor showing in competition, low marks, or a trip to the principal's office. When children are dominated by this atmosphere, getting the right answer is in itself a rather insignificant event. Thus, the emphasis in teaching and learning is not centered where it should be—in operant conditioning.

EXCESSIVE TIME LAPSE BETWEEN BEHAVIOR AND REINFORCEMENT. Unless explicit mediating behavior has been set up, the lapse of only a few seconds between a response and its reinforcement destroys most of the effect. A grade on a test taken near the end of the week is too far away from the behaviors the students emitted—sent out—in studying the subject matter earlier in the week. Reinforcing stimuli should follow the response immediately.

Through use of the generalized reinforcer—approval—schools and society reinforce acquisition of the type of behavior learned in school. This is done by awarding grades, promotions, keys, diplomas, degrees, and medals. Skinner notes that these reinforcers do reinforce going to school and gaining a diploma or degree; their shortcoming is that they seldom if ever reinforce the subject matter elements themselves.

ABSENCE OF A PROGRAM OF SERIAL REINFORCEMENT. A carefully planned program of teaching supposedly should move forward step by step by reinforcing a series of progressive approximations to the final behavior which is desired. To bring a human organism into possession of mathematical behavior most efficiently, a long series of reinforcement contingencies is necessary. Since a teacher has only so much time, he cannot deal with a pupil's responses one at a time and it is usually necessary for him to reinforce the desired behavior only in blocks of responses.

INFREQUENCY OF REINFORCEMENT. Perhaps the most serious criticism of current classroom procedures is the relative infrequency of reinforcement of the desired acts of students. It is just not humanly possible for one teacher to provide an adequate number of reinforcement contingencies for a class of 30 or 40 children. Skinner estimates that, although adequate efficient mathematical behavior at the level of the first four grades requires somewhere between 25,000 and 50,000 reinforcement contingencies, a teacher at best could provide only a few thousand. Thus, even our best schools may be criticized for their inefficiency in teaching drill subjects such as arithmetic. Advances recently made in the control of the learning process, Skinner believes, suggest that classroom practices should be thoroughly revised.

What Are the Relevant Considerations in Conditioning (Teaching) a Child?

In order to plan a procedure for inculcating certain desired behavior in a child, certain specific questions need to be answered: (1) What behavior is to be established? (2) What reinforcers are available? (3) What responses are available? (4) How can reinforcements be most efficiently scheduled?[41]

BEHAVIOR TO BE ESTABLISHED. To teach efficiently, the first job of a teacher is to determine carefully just what it is he plans to teach at a specific time. A teacher is the architect and builder of behaviors. He must decide what he wants to teach, then teach it. His objectives are specific, and they are defined in terms of desired behaviors. Thus, in determining achievement of objectives of a school, operant behaviorism requires a teacher-centered classroom.

REINFORCERS AVAILABLE. What does a school have in its possession which will reinforce a child? Since the sheer control of nature in itself is reinforcing, the material to be learned may provide considerable automatic reinforcement. Children play for hours with mechanical toys, paints, and puzzles. These feed back significant changes in the environment and are reasonably free of aversive properties. Automatic reinforcement from manipulation of the environment is probably rather mild. However, in teaching, the net amount of reinforcement in each contingency is of little significance. When properly and carefully used, a series of very slight reinforcements may be tremendously effective in controlling behavior.

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[41] *Ibid.*, pp. 152–153.

In addition to automatic reinforcement arising from manipulation of the environment, some other reinforcers are available and often used. A child behaves in a certain way and the behavior is reinforced by its immediate consequences. Reinforcement may follow from a child's excelling others. However, when he is competitively "rewarded," the reinforcement of one child is, of necessity, aversive—"punishing"—to others. The good will and affection of the teacher also may be reinforcing. A positive "reward" or "consequence" (stimulus) strengthens the behavior that is part of the contingency including that stimulus; it supposedly has nothing to do with satisfying organismic purpose.

RESPONSES AVAILABLE. In planning a program of progressive approximations that will lead to the desired final form of behavior a teacher must have an inventory of responses which are available throughout the conditioning process.

MOST EFFICIENT SCHEDULING OF REINFORCEMENTS. To schedule reinforcements efficiently means to make them contingent upon the desired behavior. Here two considerations are involved: gradual elaboration of extremely complex patterns of behavior, and maintenance of the behavior in strength at each stage. "The whole process of becoming competent in any field must be divided into a very large number of very small steps, and reinforcement must be contingent upon the accomplishment of each step. . . . By making each successive step as small as possible, the frequency of reinforcement can be raised to a maximum, while the possibly aversive consequences of being wrong are reduced to a minimum."[42]

This is the purpose of programed instruction. According to operant conditioning, ". . . learning a subject like fundamentals of electricity is largely a matter of learning (or giving) a large number of correct responses to logically related sequences of questions that constitute the subject. . . . Once a subject has been carefully divided ('programmed') into a series of many small bits of information ('steps') a student has only to learn by repetition and reward ('rapid and frequent reinforcement') the correct answer to a series of questions about the small bits of information."[43]

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[42] *Ibid.,* p. 153.

Skinner contends that the necessary requirements for adequate reinforcement are not excessive, but they probably are incompatible with current realities of present-day classrooms. Experimental studies of learning have indicated that, in order to arrange the contingencies of reinforcement which are most efficient in controlling learning in an organism, mechanical and electrical devices must be used. As a mere reinforcing mechanism, a teacher is out of date—and would be even if he devoted all his time to a single child. Only through mechanical devices can the necessarily large number of contingencies be provided. "We have every reason to expect, therefore, that the most effective control of human learning will require instrumental aid."[44]

How Do Teaching Machines Work?

In Skinner's view, education must become more efficient to a degree that cannot be accomplished merely by our building more schools and preparing more teachers; adequate systems of labor-saving capital equipment, that is, teaching machines, must be developed. He is critical, too, of traditional education which makes students more and more the passive receivers of instruction. Teaching machines, he feels, encourage students to take an "active" role in the instructional process—they must develop the answers before they are reinforced.

REQUIREMENTS OF AN APPROPRIATE TEACHING MACHINE. Skinner thinks that, in light of modern psychological knowledge, an appropriate teaching machine has two basic requirements: First, a student must compose his response rather than select it from a set of alternatives.[45] Second, in acquiring complex behavior, a student must pass through a carefully designed sequence of steps; each step must be so small that it always can be taken, yet in taking it the student must move somewhat closer to fully competent behavior, and the machine must operate so as to make sure that steps are taken in a carefully prescribed order.[46]

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[43] H. T. Fitzgerald, "Teaching Machines: a Demurrer," *The School Review,* Autumn, 1962, pp. 248–249.

[44] *Ibid.,* p. 154.

OPERATION OF A TEACHING MACHINE. Skinner anticipates no particular difficulty in producing workable teaching machines. The necessary contingencies may be arranged either mechanically or electrically. Let's see how he describes a teaching device:

> The device consists of a box about the size of a small record player. On the top surface is a glazed window through which a question or problem printed on a paper tape may be seen. The child answers the question by moving one or more sliders upon which the digits 0 through 9 are printed. The answer appears in square holes punched in the paper upon which the question is printed. When the answer has been set, the child turns a knob. The operation is as simple as adjusting a television set. If the answer is right, the knob turns freely and can be made to ring a bell or provide some other conditioned reinforcement. If the answer is wrong, the knob will not turn. A counter may be added to tally wrong answers. The knob must then be reversed slightly and a second attempt at a right answer made. (Unlike the flash card, the device reports a wrong answer without giving the right answer.) When the answer is right, a further turn of the knob engages a clutch which moves the next problem into place in the window. This movement cannot be completed, however, until the sliders have been returned to zero.[47]

What Are the Advantages of the Use of Mechanical Teaching Devices?

Skinner claims a long list of advantages available through use of mechanical teaching devices in present-day classrooms. (1) Reinforcement for the right answer is immediate. (2) Provided traces of earlier aversive control can be erased, mere manipulation of the device probably will be reinforcing enough to keep an average pupil at work for a suitable period each day. (3) All at one time, a teacher may supervise an entire class at work on such devices; yet each child may complete as many problems as possible in the class period and progress at his own rate. (4) Any child who is forced to leave school for a period may return at any time and continue from where he left off. (5) Each child may advance at his own rate and when he gets too far ahead of the class may be assigned to other tasks. (6) Through carefully designing materials, teachers may arrange problems in a serial order in the direction of an immensely complex repertoire. (7) Since the machines record the number of mistakes, tapes can be modified to enhance their effectiveness. (8) Knowing just what each student has done, a teacher can apply necessary supplementary reinforcement at the greatest vantage point.

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[45] In the 1920s Sidney L. Pressy developed a teaching machine which students used in taking and scoring multiple-choice tests; they selected, but did not formulate, the answers.

[46] Skinner, *Cumulative Record,* p. 161.

[47] *Ibid.,* p. 154.

In building a case for teaching machines, Skinner states ". . . the effect upon each student is surprisingly like that of a private tutor."[48] He then elaborates the nature of this similarity with the following points: (1) there is a constant interchange between programs and students; thus, the machine induces sustained activity; (2) the machine insists that a given point be thoroughly understood before the student moves on; (3) it presents that material for which the student is ready; (4) partly through its constructed program and partly through its techniques of prompting or hinting, the machine helps the student to come up with the right answer; and (5) like a private tutor, it reinforces the student for every correct response.

Can Machines Teach a Child to Think?

Skinner emphasizes that thinking or originality is not absence of lawfulness and it should never be considered a spontaneous process. He points out that as long as thinking is identified with spontaneity or lawlessness it is a hopeless task to attempt systematically to influence a child's thinking in any way. Thinking, like the rest of the behavior of an organism, is a lawful process. Thus, verbal behavior, in terms of which human thinking eventually must be defined, should be treated in its own right as a substantial goal of education. In inculcating this behavior, learning devices can teach verbal thinking—establish the large and important repertoire of verbal relationships encountered in science and logic.

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[48] B. F. Skinner, "Teaching Machines," *Science,* October 24, 1958, p. 971.

Skinner thinks it is of critical importance for us to realize that, in operant behaviorism, thought is not some mysterious process which is the cause of behavior, but the behavior itself. Man thinking is man behaving, and human thought is operant, not reflexive, behavior. "Shakespeare's thought was his behavior *with respect to his extremely complex environment.*"[49] "In the broadest possible sense, the thought of Julius Caesar was simply the sum total of his responses to the complex world in which he lived."[50]

Skinner observes that study of what traditionally has been called the human mind is more appropriately a study of concepts and methods which have emerged from an analysis of behavior. Thinking behavior is verbal or nonverbal, overt or covert. It is primarily the verbal behavior of men which has survived in recorded form, but from this and other records we can know something about their nonverbal behavior. When we say that Caesar thought Brutus could be trusted we do not necessarily mean that he ever said as much. Rather he behaved verbally and otherwise as if Brutus could be trusted. The rest of his behavior, his nonverbal plans and achievements, were also part of his thoughts.

Although in earlier behavioristic analyses thinking was identified with subaudible talking, Skinner feels that nothing is gained by so doing. There are difficulties in assuming that covert behavior is always executed by the muscular apparatus responsible for the overt form. Furthermore, the data which give rise to the notion of covert speech can be treated, as such, with a high degree of rigor. Rather than identifying thinking with *talking,* a better case can be made for identifying it with a special kind of *behaving,* that which automatically affects behavior and is reinforcing because it does.

Thinking is more productive when verbal responses lead to specific consequences and are reinforced because they do so. Just as a musician plays or composes what reinforces him audibly or an artist paints what reinforces him visually, a speaker or writer, engaged in verbal fantasy, says that which is reinforced by hearing it, or writes that which is reinforced by reading it. However, it must be recognized that in any case the solution to a problem is simply a response which alters the situation so that another strong response can be emitted. "Reinforcing contingencies shape the behavior of the individual, and novel contingencies generate novel forms of behavior."[51] Thus, man's present better control of the world could be described and expressed just as well by saying that the environment now is in better control of man.

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[49] B. F. Skinner, *Verbal Behavior,* Appleton-Century-Crofts, 1957, p. 450.

[50] *Ibid.,* pp. 451–452.

The key to effective teaching of thinking, as well as any other behavior, is immediate feedback. To teach thinking, we should ". . . analyze the behavior called 'thinking' and produce it according to specifications. A program specifically concerned with such behavior could be composed of material already available in logic, mathematics, scientific method, and psychology."[52]

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[51] *Ibid.*, p. 255.

[52] Skinner, *Cumulative Record*, p. 173.

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CHAPTER 6

How does Spence's quantitative S-R theory treat learning?

KENNETH W. SPENCE (1907–) an eminent contemporary research psychologist, has centered his professional efforts on an experimental study of learning. He received his doctorate at Yale in 1933. He served on the Yale staff from 1933 to 1937, spent one year at the University of Virginia, then went to the State University of Iowa where he serves as head of the department of psychology.

The ultimate goal of Spence's psychological research is to attain a high level of exact quantification of behavior theory, and to achieve this within an S-R associationistic frame of reference. Thus, his is a *quantitative S-R theory*. Probably, he is the most distinguished neo-Hullian S-R associationist.[1] In his study, he has extended and refined Hull's psychological system; however, his approach is somewhat different from Hull's. His first commitment, like Hull's, is to the proposition that learning, in some way, is a process of associating stimuli and responses. Thus, he has built his thinking upon a stimulus-response type of theoretical analysis such as Hull earlier led in establishing. However, Spence accepts only a small number of Hull's many definitions and postulates, and he pursues a much more rigorous and exacting program of research.

This psychologist is interested in securing, through experimental procedures, the same kind of precise, quantitative knowledge about behavior that scientists in physics, chemistry, and biology have developed in their respective areas. To him, behavior of living organisms, including human beings, does not differ basically from the subject matter of the other sciences. Through usage of pure —highly theoretical—as contrasted with applied—practical—research he is interested in development of a comprehensive theory of behavior and learning that will explain the different laws manifested in various behavorial situations.

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[1] See Chapter 4, pages 100–101, for a brief description of Hullian Psychology. Neo-Hullian means a new, contemporary version of Hull's psychology.

Spence carefully divorces his research results from immediate applicability to current school situations. Yet, when we look at matters from a long-range point of view, his learning theory and research may make a greater contribution to learning and teaching practices than some approaches which seem to promise much in terms of immediate results. His attempt to discover lawful relations in "pure" laboratory situations may eventually provide a better and more comprehensive understanding of effective learning in complex school situations.

WHAT IS THE NATURE OF SPENCE'S EXPERIMENTATION?

An examination of one of Spence's experiments should help us acquire some feeling for the flavor of his purposes, methods, and achievements. In 1960, he reported a series of experiments, some of which tested whether classical aversive conditioning is governed by reinforcement (see page 94 for a definition of reinforcement), or whether it occurs merely because a new, conditioned stimulus accompanies—is continguous with—the avertive or escape response. In classical aversive conditioning an organism learns to respond avertively—protect itself—when it is stimulated by a previously inadequate signal. Spence assumes that, if habit strength—learning—is found to vary with changes in the intensity of the unconditioned —adequate—stimulus, the learning which occurs is governed by reinforcement. The experiment which we now examine involves classical aversive eyelid conditioning.[2]

In *classical conditioning,* a new, conditioned, stimulus (CS) is substituted for an already adequate, unconditioned, stimulus (UCS). In classical aversive conditioning, when the new stimulus is present, the organism learns to defend itself—reacts—in much the same way as it had in the presence of the earlier, unconditioned stimulus (classical aversive conditioning is described in more detail on pages 162–163 of this chapter).

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[2] See Kenneth W. Spence, *Behavior Theory and Learning,* Prentice-Hall, 1960, pp. 164–168.

Since Spence defines learning as *habit formation,* he specifies it in terms of increments—increases—of habit strength (H).[3] His problem was to discover, in the case of a defense or aversive conditioned response, whether habit strength—learning—depends upon the intensity of the unconditioned—originally adequate—stimulus which is active in the learning situation; that is, whether the strength of the unconditioned stimulus is related to the strength of the learning.

This problem, when applied to "educational engineering," is exemplified by the following: in the presence of a loud noise, a child reflexively draws up into a startled posture. In a classical learning situation, a teacher makes a loud noise, *"NO!";* simultaneously a child hears the word "no." Does the degree of the noise, "NO!" have any bearing upon the child's learning to "hold everything" at the sound of the word "no"? The *loud noise, "NO!"* is the unconditioned stimulus, the word "no" is the conditioned stimulus. This problem is illustrated in Figure 6.1.

UCS: loud noise, *"NO!"* → Response: startled reaction
CS: Word "no" →
QUESTION: Does the loudness of the noise affect the child's learning to respond to the noise?

FIGURE 6.1 *Classical Aversive Conditioning.*

In the classical aversive eyelid conditioning experiment under consideration, the UCS was a puff of air in the right eye of a subject. The response was an eyeblink. The CS was an increase in brightness of a circular disc. Learning—increase in habit strength—is revealed by a subject's coming to blink his eye more often when the brightness of the disc is increased.

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[3] In keeping with his scientific orientation, Spence has developed abbreviated symbols for most of his principal concepts.

Subjects for the experiment were three groups of college students in an introductory psychology course. Each group contained 25 men and 25 women. Group 1 was a high reinforcement and high drive group; Group 2 a low reinforcement and high drive group; and Group 3 a low reinforcement and low drive group. *Drive* is an aroused state of an organism which is closely related to a need which activates the organism; it is a strong, persistent, internal state.

The subjects, in turn, were seated in a dental chair in a semidarkened room. Each received 100 trials. In 50 trials, the conditioning ones, each subject was presented with the CS—increase in disc brightness—paired with the UCS—air puff—and in 50, the reflexive ones, he was presented with only the UCS—air puff. Paired and unpaired trials were prearranged in an irregular order.

Drive level was controlled for each group by the strength of the air puffs which were experienced. The experiment was conducted so that the drive level (D) in terms of intensities of the UCS was equated for Groups 1 and 2 and was much lower for Group 3; Groups 1 and 2 received strong puffs on 50 trials, Group 3 received no strong puffs.

It is essential that we discern how meticulously Spence measures the strength and duration of pertinent stimuli and responses. Each CS—an increase in brightness of the circular disc from .004 to .506 foot-candles—lasted for 500 milliseconds (a millisecond is a thousandth of a second). Each UCS—air puff applied to the right eye—occurred 450 milliseconds after the onset of the CS. The duration of the UCS was 50 milliseconds. Weak puffs were .33 and strong puffs 2.0 pounds per square inch.

In the case of the high reinforcement and high drive group (Group 1), the strong puff—UCS—was always paired with the CS—increased brightness of the disc—and the weak puff was always presented without the CS. In the case of the low reinforcement and high drive group (Group 2), the reverse occurred; the weak puff was paired with the CS and the strong puff was presented alone. In the case of the low reinforcement and low drive group (Group 3), a weak puff was both paired with the CS and presented alone. Bear in mind that, on the same group of subjects, a drive level which is increased in the nonconditioning trials is still present to influence reinforcement in the conditioning trials. See Figure 6.2 for a condensed representation of the experimental design.

Gp. 1—high reinforcement and high drive	50 trials	Strong puff—UCS—paired with CS—increased brightness.
	* 50 trials	Weak puff presented without increased brightness
Gp. 2—low reinforcement and high drive	50 trials	Weak puff—UCS—paired with CS—increased brightness.
	* 50 trials	Strong puff presented without increased brightness.
Gp. 3—low reinforcement and low drive	50 trials	Weak puff—UCS—paired with CS—increased brightness.
	* 50 trials	Weak puff presented without increased brightness.

* indicates nonconditioning trials; they influence drive only.

FIGURE 6.2 *Three Experimental Groups.*

A conditioned response (CR) was recorded whenever a subject's eyelid showed a deflection of 1 millimeter or more in the interval 200 to 450 milliseconds following the onset of the CS. See Figure 6.3.

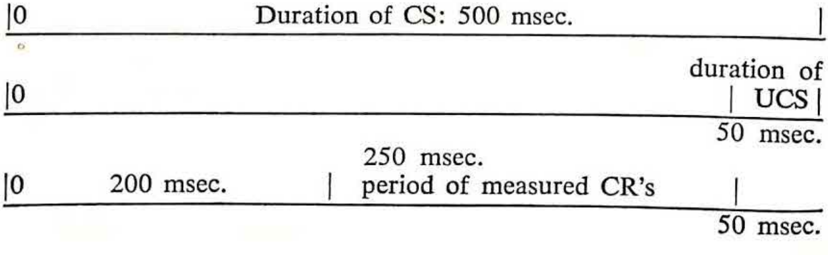

FIGURE 6.3 *Duration of Each CS, UCS, and CR.*

Figure 6.4 presents frequency curves of conditioning for the three groups. Frequency of conditioned responses is high in both Groups 1 and 2 because subjects in both groups were exposed to 50 strong puffs—drive producing stimuli. The significant difference in the performance levels of Groups 1 and 2 presumably reflects a difference in habit strength (H) which is related to the different intensities of the puff strengths—reinforcement levels—on the paired—conditioning trials. Furthermore, since Groups 2 and 3 had equated puff strengths on the conditioning—H-producing—trials, differences in the performance level of these groups presumably reflect a difference in the level of drive (D) which was controlled in the nonconditioning trials.

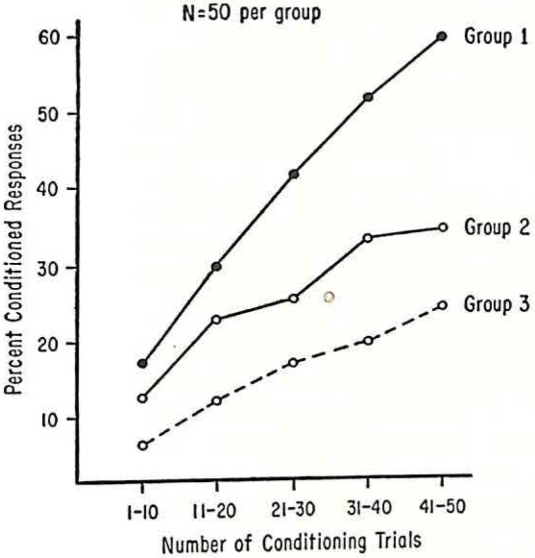

FIGURE 6.4 *Frequency Curves of Conditioning for Three Groups. An adaptation from Kenneth W. Spence,* Behavior Theory and Learning, *Prentice-Hall, 1960, p. 166.*

The differences in the levels of habit strength acquired by the three groups in the same number of trials indicates that reinforcement did occur. Consequently, this experiment indicates that *clas-*

sical aversive conditioning is governed by reinforcement; it is a function of the intensity of the UCS. This finding suggests that, in case of the problem described on page 146, the habit strength of "holding everything" at the word "no," will depend upon the loudness of the word *"NO!"* during the learning—conditioning—procedure.

WHY DOES SPENCE OFFER LITTLE IMMEDIATE, BUT MUCH EVENTUAL, HELP FOR TEACHERS?

Spence recognizes that many reputable psychologists concern themselves with human learning behavior as it occurs in everyday life situations, including schools. Such behavior has been studied by child, educational, social, and clinical psychologists. However, Spence concludes that studies conducted through more or less uncontrolled observation by these psychologists have not gone very far in attainment of precise psychological laws. Thus, he sees a great need for careful laboratory analysis of simple behavior in order to establish a comprehensive theory of learning. He observes that the history of other sciences has repeatedly shown that the adequacy of any engineering program depends upon the development of an adequate, basic foundation of scientific laws. Consequently, he thinks that an adequate educational technology likewise must rest upon a precise psychological science.

Spence believes that too much time and energy of too many psychologists is being devoted to practical human engineering rather than basic, purely scientific problems. He thinks that if psychologists are ever to bring their science "of age" they, like other scientists, must formulate an adequate system of abstract laws and comprehensive theories, and that such an achievement requires extensive use of artificial, nonlifelike, experimental conditions. Consequently Spence emphasizes that everyday, familiar instances of behavior do not, and should not, constitute the data with which a learning psychologist is concerned. Spence, as a learning psychologist, deliberately chooses *not* to concern himself with "real-life" situations. He states, "The fact of the matter is that we so-called learning theorists, particularly those of us whose research has been conducted mostly with animal subjects, have not been interested in the practical aspects of learning for many years."[4]

For Professor Spence, defensible psychological laws and theories must have their origin in data obtained from highly controlled laboratory situations. Such laboratory arrangements have included study of the lever-pressing behavior and running speed of rats, the salivary responses of dogs, and the blinking of human eyelids. Seldom, if ever, are these studies related to instances of workaday learning.

There are definite reasons why Spence, and other learning psychologists of his disposition, choose to concentrate their efforts on rats, dogs, monkeys, and eyelids rather than gross human activity. They emphasize that the first objective of a scientist is to discover the low-order, empirical, and lawful relationships which prevail among the particular variables specified by his field of study and measuring technique. They note that research scientists in various areas of knowledge never hesitate to arrange "unreal" situations in order to achieve their goals. Physicists question the possibility of achievement of a perfect vacuum. Nevertheless, they have in no way avoided theorizing about a vacuum and experimentally approximating one. Furthermore, biologists devote much time and energy to the study of isolated tissues in test tubes, yet a tissue is a far cry from a total organism. The point is that, in scientific research, artificial arrangements help discover laws which in time provide explanations of events of "real" life.[5]

According to Spence, a scientifically oriented psychologist, as such, should never concern himself with the question of whether any particular realm of behavioral study is close to "real" life. The only criterion for priority in investigation, other than the personal curiosity of the psychologist, is whether an area of study lends itself to the degree of scientific control and analysis necessary for formulation of pertinent abstract laws and comprehensive theories.

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[4] Kenneth W. Spence, "The Relation of Learning Theory to the Technology of Education," *Harvard Educational Review*, Spring, 1959, p. 85.

[5] See Kenneth W. Spence, "Current Interpretation of Learning Data and Some Recent Developments in Stimulus-Response Theory," in Donald K. Adams and others, *Learning Theory, Personality Theory, and Clinical Research*, Wiley, 1954, p. 2.

"Being guided by such purely scientific objectives, and not having any special interests, humanitarian, religious, social betterment or otherwise, no particular area of human or animal behavior is seen as more important than another."[6]

WHAT IS THE NATURE OF SPENCE'S PSYCHOLOGICAL THEORY?

Spence takes it for granted that things around him which he perceives—his world—are independently real, and that they can be investigated by observation. Thus, he may be identified as a naturalistic realist or logical empiricist. For him, science is concerned only with knowledge which reliably can be made a matter of public record and thus be taken out of the realm of private experience.

Spence's basic assumption is that behavior has sufficient order and regularity that lawful descriptions of it may be found. Such lawful descriptions are to be achieved in the same manner that scientists in other disciplines supposedly find their laws. Since behavior is assumed to be, at least in part, a function of the forces *exerted upon* organisms, explanation of what people, or other organisms, do is sought in their general organic condition and the physical and social circumstances which surround them.

As a scientist, Spence prefers to keep as far away as possible from metaphysical or supernatural issues. He is not concerned with any analysis of the various philosophical definitions of knowledge and its attainment. Neither does he use data based on introspection or empathic projection. *Empathic projection* means that one experiences a situation from another person's point of view or places himself in "another's shoes." Spence thinks that introspective or empathic knowledge, if there is such, does not meet the criteria for pertinent data of the natural sciences. However, he grants that introspection may be accepted as verbal behavior and given the same status as any other behavior as long as it is not asserted to be isomorphic—of like form—to a private, internal "world" of a subject.

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[6] Kenneth W. Spence, *Behavior Theory and Learning,* Prentice-Hall, 1960, pp. 79–80.

There is no place in Spence's psychological system for concepts such as perceptual interaction or life space. However, he does not object to other persons developing introspective or empathic knowledge about human personality, provided such knowledge is not called "scientific." His only criterion for selection of items or aspects of experiential data for scientific study is a high degree of agreement among competent observers concerning a particular observable datum.[7]

According to Spence, scientific psychology today is at about the same point of development that physics was at the time of Kepler and Galileo—the seventeenth century. He wants psychologists to have the same opportunity to develop a scientific account of their discipline as their colleagues in the physical and biological sciences have had. "As scientists we are interested in discovering and formulating a body of knowledge concerning the behavior of living organisms that is continuous with and has the same properties, empirical and logical, as the knowledge sought in the other natural sciences. Since the attainment of such knowledge requires methods of observation that assure publicly verifiable concepts, we have naturally insisted on the use of such techniques."[8]

Why Does Spence Study "Molar" Behavior?

Spence distinguishes between "molar" and "physiological" descriptions of behavior.[9] Molar behavior as he defines it, consists of an organism's performance of some task or function, such as pressing a bar, running down an alley, or choosing between two alternative actions. In contrast, a physiological description of behavior would be in terms of organic functions, sensory and motor impulses, and muscular contractions. In light of this distinction, he considers his task as a psychologist that of studying molar behavior in a way that will yield general laws concerning it.[10]

Spence recognizes that all molar behavior probably has physiological aspects. However, at the present—mid-twentieth century—stage of development of psychology, he sees little value in employment of physiological concepts. By present maintenance of a neutral position in regard to physiological descriptions of learning, he leaves the way open for future, effective physiological concepts in psychology.

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[7] *Ibid.*, pp. 74–75.

[8] *Ibid.*, p. 79.

[9] *Ibid.*, p. 36.

[10] See Chapter 3, pages 63–64, for Gestalt-field psychologists' somewhat different use of the concept *molar*. To them, the opposite of molar is "molecular" or "atomistic," not "physiological."

How Are Psychological Laws Discovered?

Spence thinks that psychologists, as scientists, should first attempt to discover generalized laws which interrelate the observable events of behavior with one another. Then, the next step is to formulate theories, each of which is a generalization that represents a number of laws.

In the process of discovery of laws, Spence and his students isolate and describe various aspects of learning situations to see what interrelations are involved. They think that a study of simple behavioral changes contributes most to their discovery of underlying laws. In the process of study, they manipulate or control various aspects of an organism's environment which elicit and follow its responses and, at the same time, manipulate motivational or drive factors in their subjects. The experiment reported on pages 145–150 is an example of this type of scientific procedure.

Professor Spence anticipates that eventually much of the behavior of living organisms will be described in terms of the same types of quantitative "pointer readings" as now employed in physics. He states that practically all of the observations of psychologists who employ animals as subjects in their studies are of this quantitative type. Examples of significant data are the time required to run down an alley, the rate of depressing a lever, or the amplitude of a conditioned leg flexion.

How Are Constructs Used?

To accomplish their respective tasks, scientists in all fields employ the most effectual constructs they can devise. A *construct* is a created, usable concept. To Spence, constructs are either empirical or theoretical. The principal *empirical constructs* are *independent* (stimulus) and *dependent* (response) variables in the form of behaviors which are open to public inspection. His *theoretical constructs,* in contrast, are *intermediate* or *intervening* variables such as motivation, drive, and learning, which are not physically observable.

A *variable* is a pertinent, changing factor in a situation. It is a quantity which may be increased or decreased without an essential change in the nature of the element that has the quality with which we are concerned. The amount of snow on the ground is a variable; there can be more or less of it. In an experiment, a condition—independent variable—is altered, and the result—dependent variable—is observed and, if possible, measured.

The *dependent* variable is the consequence to be observed; it depends upon the conditions of the experiment. The conditions of the experiment constitute the *independent* variables. In the experiment reported on pages 145–150, the independent variable was the manipulated intensity of the air puff. The dependent variable was the organisms' blinking their eyes more often. Intervening variables were the controlled variations in reinforcement and drive, and the increase in habit strength—learning.

What Is the Purpose of Psychological Theory?

For Spence, a theory is a broad generalization which is based on known laws. It should reflect correctly both the known and the unknown laws of behavior. Spence's primary concern is to build a theoretical model with which we may derive and interrelate the specific laws found in different learning situations. He begins his endeavor with experimental findings from the two simplest kinds of learning situations—classical and instrumental conditioning. Based on data acquired in these situations he proposes, and later tests for, a system of laws involving both intervening and experimental variables. His theoretical models are tested in terms of the degree to which they are able to predict lawful relations which will appear in new, pertinent data.

Through experimentation, Spence has collected a variety of learning curves involving different organisms, apparatuses, and response measures. He, then, has shown that they all may be considered special instances of a few hypothetical equations. He states, "As yet only a start has been made toward the development of the type of higher-order generalizations (i.e., theories) that serve to integrate or unify the laws specific to each experimental situation."[11]

Spence implores psychologists to make more effective, positive use of theories and not to take the negativistic attitude that theories are something to be proved wrong. He reminds them that:

> A theory in science serves to bring order and meaning into a particular realm of events. The task of ordering a set of events consists in discovering relations among them, or as we say, in finding empirical laws. In the initial phases of this search we employ the process of inductive generalization from observation and experiment. In the physical sciences this process is straightforward enough, for the scientist in this area is able to arrange for simple systems of observation that permit the isolation and control of a relatively small number of variables. Unfortunately the behavior of living organisms does not yield so readily to simplification and control. The greater complexity of psychological phenomena makes difficult, if not impossible, the experimental isolation and measurement of the relevant variables. Consequently psychologists have found it necessary to guess or theorize much more than physicists had to at this stage of development in their field of knowledge.[12]

Spence and his associates are trying to develop a system of psychological theories—high-order generalizations—that will enable them to derive the different "empirical functions"—observed relationships—between empirical variables found in various types of conditioning experiments. They hope and believe that such a theoretical psychological structure will permit them to account for more complex learning phenomena in addition to that upon which their studies are based. *These psychologists consider the business of psychological science that of ascertaining which objective factors in the past and present conditions of organisms and their enviroments account for their differences in response.* When they attain this objective, psychologists can predict behavior instead of merely attributing it, after it has happened, to some difference in the environment;

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[11] Kenneth W. Spence, "Current Interpretations of Learning Data and Some Recent Developments in Stimulus-Response Theory," in Donald K. Adams and others, *Learning Theory, Personality Theory, and Clinical Research,* Wiley, 1954, p. 3.

[12] Kenneth W. Spence, "Theoretical Interpretations of Learning," in S. S. Stevens, Ed., *Handbook of Experimental Psychology,* Wiley, 1951, p. 690.

they will have formulated general laws and theories which have a wide range of application to particular instances of behavior.

HOW DOES SPENCE STUDY LEARNING?

For Spence, learning phenomena consist of ". . . behavioral changes that occur with repeated experience [trial occasions] in the same or essentially similar situations . . ."[13] He attributes the progressive changes in behavior that occur in a learning experiment to changes in a theoretical "learning state" which result from previous experiences in a situation. *Learning,* then, *is a nonobservable, hypothetical construct;* it *intervenes between observable independent and dependent variables.* When learning is defined this way, there is a difference between performance and learning. Performance refers to an observable, measurable response. Learning, a postulated, hypothetical factor, is less tangible; it ". . . is assumed, on the one hand, to be the product of the past interactions of the individual with his environment, and, on the other, to be one of the conditions that determines his performance at any moment."[14]

Learning, while nonobservable in itself, is inferred from the changes that occur in the behavior of a subject on successive trial occasions. Spence, an S-R associationistic psychologist, records and measures these changes in the properties of observable behavior and attempts to ascertain the factors or variables that are related to them. Whereas he is primarily concerned with laws of learning which relate changing responses to successive trial occurrences, he also is interested in all of the variables that determine behavior in learning situations.[15]

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[13] Kenneth W. Spence, "The Relation of Learning Theory to the Technology of Education," *Harvard Educational Review*, Spring, 1959, p. 85.

[14] Spence, "Theoretical Interpretations of Learning," p. 691. "Interaction" as used in this quotation means alternating reaction, not simultaneous, mutual interaction, of person and environment as in field psychology. See Chapter 3, pages 74–76.

[15] See Kenneth W. Spence, *Behavior Theory and Conditioning*, Yale University Press, 1956, pp. 51–52.

What Variables Determine Behavior?

A two-fold task confronts an S-R associationistic learning theorist: (1) specification of the experimental variables, both organic and environmental, that determine the observed behavior changes which occur during an organism's activity, and (2) formulation of the functional interrelations—laws—which hold in regard to "sets of variables"—behavioral situations. The second of these two tasks requires extensive use of intervening variables.

In keeping with the purposes of an S-R associationist, Spence performs observations and experimentation to lead to discovery and formulation of a body of low-order laws of behavior. He then postulates some intermediate, intervening, learning intangible variables. In his experiments, he changes or controls independent variables, then measures the dependent variable which ensues, and thereby infers the intervening variable. *Independent and dependent variables are in the form of stimuli and responses; intervening variables are not.* (See page 155 for definitions of independent and dependent variables.

Stimulus, or *input,* variables are qualitative descriptions or measurements of events or properties of the physical and social environment in which the organism behaves. They consist of everything that impinges upon an organism, either internally or externally, prior to and, at the time of, the behavior being studied. However, as Spence notes, ". . . the presence of a particular situational stimulus does not guarantee that it will also be a stimulus for the organism at the moment of responding."[16]

We should not give stimulus variables too narrow a definition; they may be situational, effective, or intraorganic. Situational stimuli arise from physical objects or events in the environment; they may be specified quite independently of the responding organism, and are under the direct control of the experimenter. Effective stimuli refer to the particular situational stimuli that are acting upon and exciting the organism's receptors at the time of a response. These, to a considerable extent, are dependent upon the organism's receptor-orienting behavior. Both situational and effective stimuli are received through exteroceptors—sense organs stimulated directly by energy changes outside the body. Intraorganic stimuli are those stimuli whose properties are specified on the basis of known physiological laws or hypothesized organic internal relations; they are received through interoceptors—sense organs located in the viscera of a body—or proprioceptors—sense organs excited by activities of parts of a body, such as the muscles.[17]

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[16] *Ibid.,* pp. 30–40.

Response, or *output,* variables are qualitative descriptions or measurements of the behavioral properties of living organisms. Each response involves a chain or sequence of acts. It is described in "molar," not "physiological," terms.

Intervening variables intervene—psychologically occur—between independent stimulus variables on one hand and dependent response variables on the other. They are introduced into psychology ". . . either when we do not know all the important variables entering into a set of experimental events, or the precise nature of the interrelating function is not known."[18] Thus, the intervening variables of learning theory serve as general or abstract terms applicable to a variety of situations. Consequently, ". . . learning is to be conceived in terms of alterations in the strengths of hypothetical intervening variables, variously referred to as S-R connections, associations, habits, or tendencies."[19]

Psychologists use the independent and intervening variables in a situation such as stimuli, practice, drive, and reward to predict responsive behavior—the dependent variable. Such a prediction is in terms of whether the response will occur, how quickly it will occur, and what its amplitude—amount of change—will be. Often this is stated by Spence in terms of a "terminal" construct—"excitatory potential" (E). *Excitatory potential* means the likelihood, speed, and change of a response which is the result of a conditioning process and which correlates with the quantitative characteristics of a response. Independent variables feed into excitatory potential, and dependent variables are determined from it.

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[17] *Ibid.*, p. 41.

[18] Spence, *Behavior Theory and Learning*, pp. 28–29.

[19] Spence, "Theoretical Interpretations of Learning," p. 692.

How Does Reinforcement Work?

A conditioning process may, or may not, include reinforcement. Spence suggests that his learning theory might be called an S-R expectancy—half reinforcement and half contiguity theory.[20] In classical aversive conditioning, involving escape motivation, he proposes a reinforcement principle. However, in instrumental reward conditioning which involves some form of appetitional motivation, he prefers a contiguity—nonreinforcement—principle. *Conditioning* simply means that one stimulus or response is attached to another stimulus or response so that revival of the first evokes the second. To Spence, *reinforcement* is a process within which an event accompanies a response and thereby increases the probability of that response occurring on a subsequent occasion. Formerly, when "drive" or "need" was conspicuous in the Hull-Spence psychological system, reinforcement signified that the tendency for a stimulus to evoke a response or for a behavior to occur on subsequent occasions was increased by reduction of either a need or a drive. However, in his more recent work Spence emphasizes that he is *not* a drive reduction theorist. Consequently, in discussing reinforcement, he often uses *motivation* as an alternative to drive.

A drive is a strong, persistent, internal state; its level may be increased by deprivation of food or water, giving or increasing an electric shock, or by some other means which stimulates an animal to activity. When Spence says, "I am not a drive reduction theorist even in the case of aversive conditioning," he is not discarding the term "drive." Rather, he is asserting that he does not assume the existence of need or drive reduction every time reinforcement occurs. Need or drive reduction is one, but not the only, theory about the mechanism of reinforcement.

Motivation may be considered an alternative to drive. To Spence, motivation is indicated by an increase in the level of an organism's responding in a situation. Throughout his professional career, he has become more interested in the study of motivation of organisms; he has appeared to transfer emphasis in motivation from reduction of drives to more positive aspects of behavior related to "incentives," or the activities an organism prefers and is drawn toward.

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[20] See Chapter 4, pages 98–101, for summaries of Hull's reinforcement and Guthrie's contiguity theories of learning.

Through his development of the meaning of *fractional anticipatory goal responses* (see pages 164–165 for an exploration of this difficult concept), Spence approaches a concept such as field expectancy or insight as developed in Chapter 4, page 102. For instance, he indicates that, in complex learning, changes in performance—reaction potential—are not as dependent upon the previous strength of association between pertinent stimuli and responses as they are upon the presence or absence of a secondary reinforcer—the incentive value of particular stimuli.[21] He then provides for purpose mechanisms in behavior by means of introducing the concept, "incentive motivational factor" (K) (see page 164).

HOW DOES SPENCE EXPERIMENT WITH LEARNING?

Spence's experiments with learning involve classical conditioning, instrumental conditioning, and selective learning. *Classical* conditioning may be either reward or aversive conditioning, and *instrumental* conditioning may take the form of either reward or escape conditioning. However, Spence has concentrated his study on classical aversive and instrumental reward conditioning. *Classical aversive conditioning* occurs when an organism learns to react defensively to a new, conditioned stimulus much as it previously had to an originally noxious unconditioned stimulus. *Instrumental reward conditioning* occurs when an animal learns to behave in a given manner because it is "rewarded" when it manifests the given behavior. *Selective learning* may be either spatial trial-and-error or discrimination learning.

Spence treats the study of classical conditioning, instrumental conditioning, and selective learning each in detail as if they necessitate three completely different kinds of experimentation. However, he reminds us that classical conditioning really is an inherent part of instrumental conditioning, and instrumental conditioning situations are special cases of trial-and-error selective learning. We now discuss Spence's experiments with each type of learning in some detail.

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[21] See Chapter 5, pages 00–00, for a discussion of primary and secondary reinforcement.

How Does Classical Conditioning Work?

As we explain on page 145, in classical conditioning a new, conditioned stimulus is substituted for an already adequate, unconditioned stimulus, as was the case when Pavlov trained his dogs to secrete saliva at the sound of a bell. Spence suggests that reinforcement plays a decisive role in acquisition of habit strength—learning—in classical aversive, but not in instrumental reward, conditioning.[22]

In classical aversive conditioning, the excitatory potential (E)—likelihood, speed, and change—of a classical conditioned response is increased by two intervening variables, habit and drive. Habit (H) links a response to a stimulus and is acquired gradually as a function of reinforced trials—pairing of conditioned and unconditioned stimuli along with the response.

Drive (D) is the major intervening variable. *General drive* arises from all the needs of the organism that are present at any one time and which activate habits; it reflects both the primary and the secondary needs that are present. *Primary needs* depend upon deprivation of necessities such as food, water, and sex objects, and upon intensity of any noxious stimulation such as shock. This latter represents aversive drive. *Secondary needs* depend upon the presence of stimuli which previously have been paired with achievement of satisfying stimulation or escape from noxious stimuli. We have a secondary need for money because it has been paired with both our receipt of satisfying stimuli and our escape from noxious, undesirable stimuli.

An example of classical aversive conditioning occurs when a subject closes his eyelid as a puff of air strikes the cornea; he concurrently hears a tone, and eventually he comes to close his eyelid at the sound of the tone even in the absence of the noxious stimulus—the puff of air. The experimenter limits the response to a single, brief act—closing the eyelid—by having the noxious, unconditioned stimulus and the tone to be conditioned occur together for only a brief time. The tone becomes a conditioned stimulus.

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[22] Experiments such as the one reported at the beginning of this chapter, pages 145–150, support this thesis.

In classical reward conditioning, the response is elicited by the reinforcing object—food, in the case of Pavlov's dogs. Thus, this object serves a dual function; it elicits the unconditioned reflex and provides the reinforcing event which brings about the conditioning of a substitute stimulus—the bell.[23]

What Is the Nature of Instrumental Conditioning?

In both classical and instrumental conditioning experiments, the experimenter aims to arrange for the occurrence of but a single response or response chain which is followed by reinforcement, conditioning, or extinction of the S-R relation. In instrumental reward conditioning, the experimenter attempts to choose the strongest—most likely—response as the one to be conditioned. He then limits his investigation to a study of the strengthening of this single response. Thus, "Most instances of instrumental conditioning are really limiting cases of trial-and-error learning in which competing responses, while minimized, still play a more or less important role."[24]

In the maze type of instrumental conditioning, an animal is placed in a single "straight-ahead" alley and no responses other than his going down the alley are recorded. Of course, he usually develops some competing responses other than merely going straight down the maze; he may turn his head or attempt to go up the side of the maze. However, each experiment is designed so that the major role is played by the response being conditioned.

The animal is deprived of food for a specific length of time. He then is placed in a runway, and his behavior is rewarded at the end of the runway—he receives food. This is instrumental reward conditioning. Some properties of the "to be learned" response, which are measured in instrumental reward conditioning, are: (1) the time it takes the behavior chain to get started, (2) the time it takes some fraction of the whole chain to run off, and (3) the number of times the response occurs over a period of time.[25]

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[23] Spence, *Behavior Theory and Conditioning,* pp. 46–49.

[24] Spence, *Behavior Theory and Learning,* p. 122.

Spence's special thesis is that, just as reinforcement is crucial in classical conditioning, it is not essential to instrumental conditioning. Remember that classical conditioning is stimulus substitution, and instrumental conditioning is response modification. In instrumental conditioning, as Spence sees it, stimuli and responses are associated merely because they occur together; this is the law of contiguity.

Spence's key terms in his treatment of instrumental reward conditioning are *fractional anticipatory goal responses,* and a companion concept, *incentive motivational factors.* A fractional anticipatory goal response is an *acquired* incentive motivational factor.

In a chain of activity which transpires prior to an organism's reaching a goal, instrumental responses are strengthened merely because they occur, not because of their being reinforced through some act at the end of the chain of activity—reaching the goal. However, a reinforcing act at the end of the chain—classical conditioning—does strengthen the successively acquired motivational factors—fractional anticipatory goal responses (r_g's)—which occur between the starting point and the goal. Thus, respective r_g's affect earlier links of the chain of activity as incentive motivational factors, not as reinforcers. Spence states, ". . . the evidence strongly suggests that the habit strength of instrumental reward responses is not a function of the level of appetitional needs during acquisition."[26] Thus, the habit strength of an instrumental response is not dependent upon the properties of its "reinforcer."

As previously stated, in instrumental learning involving reward, classical conditioning also is taking place. For conditioning to occur, a subject must respond to a goal object either by consuming it or by perceiving it. Thus, events at the goal are important. Such a reinforcing act produces the conditioning of fractional goal responses to stimulus cues throughout the response chain of the activity prior to the goal. These conditioned responses (r_g's) and the stimuli they produce (s_g's) serve as important integrators of behavior; they are incentive motivational factors (K's).[27] The strength of the incentive motivational factor at any stage of instrumental reward learning depends upon the conditions of reinforcement at the end of the chain of activity—the magnitude and delay of reinforcement at the end of the chain—and on the stage of training—the number of previously reinforced trials.

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[25] See Spence, *Behavior Theory and Conditioning,* pp. 37–39.

[26] *Ibid.,* p. 168.

Whereas needs and drives are organism-centered, r_g's are "goal-oriented." The longer the behavior chain from the initial action to reinforcement at the end, the less similar are the stimulus cues at the beginning to those at the end of the chain, and hence the weaker are the fractional anticipatory goal responses at the beginning of the sequence. The ". . . differences in reaction potential (E) of responses at different distances from the reinforcement end of the behavior chain are due to differences in the [incentive motivational] K factor rather than to differences in [habit strength] H."[28]

How Does Spence Study Selective Learning?

Selective learning consists of spatial trial-and-error and discrimination learning. It is an extension of instrumental conditioning to experimental situations designed so that two or more equally strong chains of responses are possible, or several stimuli "compete" for evocation of a response. Whereas in trial-and-error learning the subject selects a response from among competing responses, in discrimination learning the subject selects a stimulus from among competing stimuli.

In studying spatial trial-and-error learning Spence experiments with a single choice point type of maze which has two or more choices at the choice point. The subject learns to turn and proceed in one direction consistently.

Figure 6.5 shows the ground plan for a single choice point maze. An animal is placed in the starting box (SB) and he is to learn upon reaching the choice point to enter and run down alley c to reach the goal object (a piece of food) in end box C and not to enter alleys d or e which lead to empty end boxes D and E.

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[27] See Ernest R. Hilgard, *Theories of Learning,* 2nd ed., Appleton-Century-Crofts, 1956, p. 416.

[28] Spence, *Behavior Theory and Conditioning,* p. 151.

What Are the Components of Trial-and-Error Learning?

A spatial trial-and-error type of experiment has four major components: (1) a motivated organism, (2) an environmental choice situation which offers several alternate response possibilities, (3) the behavior possibilities of the organism, and (4) the situation or stimulus events consequent to the several responses.[29]

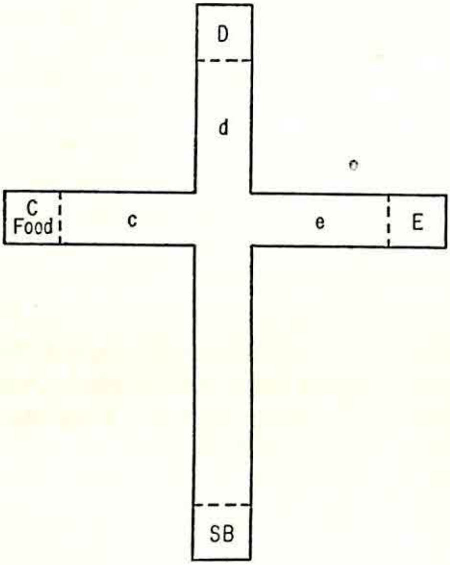

FIGURE 6.5 *Ground Plan of the Single Choice Point Maze. An adaptation from Kenneth W. Spence,* Behavior Theory and Conditioning, *Yale University Press, 1956, p. 28.*

A MOTIVATED ORGANISM. An organism is motivated when it is deprived of some appetitional need such as food or provided some discomfort such as shock. Motivation is achieved by manipulating the organism's past or present environment so that tension within the organism is created or increased.

AN ENVIRONMENTAL CHOICE SITUATION. Such a situation offers a number of discriminable aspects or objects which may serve as potential stimuli to which the animal may respond in several different ways. In the maze pictured in Figure 6.5, potential stimuli to which the organism may respond are the three alternative pathways, the wire top of the apparatus, the door leading from the starting box, corners of the choice chamber, and others. The environmental choice situation, as such, contains no reinforcing agent—food or escape from shock. Furthermore, any relation of the various points of the maze to a reinforcing event is not immediately apparent without occurrence of the appropriate response; the animal is not trying to do anything and is not "sizing up" the situation in which it is involved.

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[29] *Ibid.*, pp. 28–34.

BEHAVIOR POSSIBILITIES. An organism brings to a new situation a variety of innate and acquired response tendencies which differ in relative strengths or likelihood of occurrence. A combination of the motivating state and the environmental situation impels the animal to respond to various aspects of the situation until a reinforcer is reached or the animal is removed from the situation. Each response consists of a chain of movements or skills which involve sensory-motor integrations of varying complexity that have been acquired prior to the experiment. Trial-and-error learning is a process of elimination of erroneous responses and establishment of the correct response so that it occurs promptly on each trial. The course of simple trial-and-error selective learning is marked by gradual decrease in frequency of occurrence of incorrect, nonreinforced response chains and gradual increase in the frequency of occurrence of the correct, reinforced response sequence.

CONSEQUENT STIMULUS EVENTS. A selective trial-and-error type of experiment is designed so that one potential response, the *correct* one, leads to a reinforcing event, while all other responses do not bring reinforcement. Now, what are reinforcers?

Spence develops the meaning of reinforcers by describing how reinforcement occurs. Thus, he notes that in simple selective learning situations, psychologists have observed that, when certain types of environmental events accompany or follow a particular response, the response is more likely to occur on subsequent occasions. Moreover, omission of such events following a response may be observed to lead to a lessened likelihood of its occurrence. *Reinforcers* or *reinforcing events* are environmental events which exhibit the property of increasing the probability of occurrence of responses they accompany. All environmental events which do not exhibit this property fall into a different class called *nonreinforcers*. By means of these two classes of events—reinforcers and nonreinforcers—it becomes possible to formulate the following law: "Responses accompanied or followed by certain kinds of events (namely, reinforcers) are more likely to occur on subsequent occasions, whereas responses followed by certain other kinds of events (namely, non-reinforcers) do not subsequently show a greater likelihood of occurrence."[30] In the experimental design depicted in Figure 6.5, food is a reinforcer.

How Does Discrimination Differ from Spatial Trial-and-Error Selective Learning?

As stated on page 165, *in* discrimination selective learning a subject selects a stimulus from among competing stimuli. In a discrimination maze, the subject must learn to enter a certain colored arm regardless of its position; one may be white and the other black, but their relative positions are changed repeatedly throughout the learning period. The organism must select—respond to—the right stimulus. Thus, the two types of selective learning experiments, trial-and-error and discrimination, have much in common.

Spence has confined his discrimination learning experiments to relatively simple situations in which ". . . the stimulus configuration contained two discriminanda [alternatives] differing in a single attribute or dimension such as brightness, size, form, etc."[31] However, he anticipates extension of his study to more complicated types of discrimination learning which involve the principle of patterning. In testing a theory of discrimination he prefers to employ simpler types of stimulus cues such as brightness, rather than more complex ones such as form and size.

WHAT MAY QUANTITATIVE S-R THEORY OFFER SCHOOLS OF THE FUTURE?

To positivistic psychologists, such as Spence, there is a science of learning and a technology of education, and we should distinguish sharply between the two. Teaching and education are related to psychology and the other behavioral sciences in the same way that engineering is related to the physical sciences and medicine to the biological sciences. Just as engineers use scientific knowledge to design and shape hardware, educators likewise should use scientific knowledge to design and shape human "software."

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[30] *Ibid.*, p. 33.

[31] Spence, *Behavior Theory and Learning*, p. 390.

Spence, to date, has confined his experimentation to simple learning situations involving classical and instrumental conditioning and selective learning. However, he anticipates that, in time and with the addition of some new variables, the basic principles and theories derived from study of simple learning situations will be applicable to behavior such as children display in school. He and his associates have chosen to investigate simpler phenomena first because of their conviction that it is in this area that formulation of psychological laws and principles will be most rapid.

Although Spence's psychological study is not applied to school situations as such, teachers may assume that his findings in experiments with simple phenomena will apply, perhaps with adaptations, to complex learning situations. However, in applying these principles, teachers, too, should adopt an experimental attitude; they should proceed on the basis that Spence's research results are sound, and take careful note of the educational outcomes of their application. They should bear in mind that "The laws that the experimental learning psychologist has discovered and the theories that he has formulated with respect to them grew out of these laboratory phenomena and as yet have not been related to instances of learning in 'real life.' "[32]

Spence thinks that, insofar as the variables operating in simple behavior are also present in complex behavior, the same psychological laws will hold. However, he recognizes that, in more complex situations, there will be additional variables and that lawful relations of the new variables to the more basic ones will need to be taken into account. He feels that we are at least beginning to attain the knowledge necessary to predict and hence control behavior in new situations. He states, "Twenty-five years of experimentation with classical and instrumental conditioning have led to the discovery and formulation of a quite extensive body of fairly precise quantitative laws descriptive of the manner in which the stimulus, motivational, and incentive variables interact with each other and with various practice variables to determine performance in these situations."[33] However, he sees a great need for study of situations involving different numbers and different delays of reinforcement, and those where a response tendency is weakened by nonreinforcement—extinction.

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[32] Kenneth W. Spence, "Current Interpretations of Learning Data and Some Recent Developments in Stimulus-Response Theory," in Donald K. Adams, *et al.*, *Learning Theory, Personality Theory, and Clinical Research,* Wiley, 1954, p. 2.

In What Learning Areas May Research Be Developed?

Spence thinks that psychologists eventually should design experiments which will result in studies revealing lawful relationships in at least six major areas of human activity.[34] These areas are classical and instrumental conditioning; spatial, nonspatial, and verbal selective learning; rote and maze serial learning; perceptual and motor skills learning; symbolic learning in the form of thinking and reasoning; and social learning in the form of attitudes and interests. He feels that adequate research in these areas ultimately will produce the knowledge needed for teachers effectually to direct the learning of students.

As to whether theories developed from laboratory experiments, when sufficiently elaborated, will enable explanation and control of behavior in real-life situations, Spence can only point to the success that such a type of theory has had in the physical sciences and assume that the same development will occurr in psychology. In laboratory investigations of human behavior, psychologists have developed their objective methods of quantifying properties of behavior and its effects similar to the procedures ". . . in the other biological and physical sciences."[35]

How Is Language Related to Learning?

The fact that human beings talk to themselves and to others must be given careful consideration in a study of human learning. When principles developed through study of the behavior of lower animals are extended to man, language becomes an important factor. Indeed, Spence thinks that study and analysis of language behavior of human beings is the key to investigations of complex motives, human adjustment, conflict and anxiety, attitudes and interests, and problem solving and reasoning. He feels that psychologists have made only the barest beginning in these areas and that they should attempt to study all of the areas by objective techniques before they decide that some are not susceptible to empirical investigation. Spence grants that perhaps some aspects of human activity, such as selfhood and conscience, cannot be studied objectively, but he thinks we should attempt their study before decreeing that it cannot be done.[36]

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[33] Kenneth W. Spence, "The Relation of Learning Theory to the Technology of Education," *Harvard Educational Review*, Spring, 1959, p. 90.

[34] *Ibid.*, p. 92.

[35] Spence, *Behavior Theory and Learning*, p. 76.

Words are a type of human stimulus and response, but they differ somewhat from simple, pure stimulus acts or cue producing responses. Let us examine how a quantitative S-R theorist like Spence sees language entering behavior situations.[37]

1. Words are stimuli. Words may constitute or modify a stimulus complex or pattern and elicit classical or instrumental responses which previously have been conditioned to those words. A person comes to respond to "snake" as if a snake were present.

2. Words are responses. Like other behaviors, verbalizations have different habit strengths of association with different stimulus words. In middle-class American culture the habit strength of "sex" and "sin" is stronger than is the habit strength of "food" and "sin."

3. Conditioning may be a verbal process. A human organism may gain additional habit strength by performing stimulus-response-reinforcement sequences verbally. Symbols may be stimuli and responses, and their connections may be reinforced by a symbolic stimulus. A teacher says—stimulates the child with—"dog"; the child says—responds with—"D-O-G"; the teacher says—provides the reinforcement—"Good." The effect of this verbal conditioning process depends upon the correspondence between the actual situation and the implicitly—verbally—practiced relationship.

4. Words become secondary drive objects. A secondary drive

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[36] *Ibid.*, p. 80.

[37] See Frank A. Logan, "The Hull-Spence Approach," in Sigmund Koch, Ed., *Psychology: A Study of a Science*, McGraw-Hill, 1959, p. 302.

object induces an aroused state of an organism because it is associated with a need which activates the organism. A word may be conditioned as a secondary drive stimulus; in turn its occurrence will affect the organism's motivation as a secondary drive object. The word "dentist" is neutral to a child the first time he hears it. However, with a few visits to a dentist, it soon becomes closely associated with evocation and rapid decreases of drive-produced stimuli—pain. "Dentist" comes to be something to be escaped or avoided; it is a secondary drive object. It has acquired a tendency to bring about painful drive stimuli.

5. Incentive motivation can be affected by verbal cues. Words can be used as secondary reinforcers. Secondary reinforcement occurs when an originally neutral or impotent stimulus becomes associated with some primary reinforcing stimulus and thereby itself becomes effective in reducing a need.[38] To span a long delay of actual reinforcement, an individual says, "I'll get paid for this tomorrow," and he proceeds to perform a task for which there is no immediate reward other than his talking to himself. Or, a previous stimulus-response sequence can be reinstated verbally immediately preceding a reinforcement: one says, "I'm getting paid for what I did yesterday."

What Is Spence's Attitude Toward Programed Learning?

Although Spence's own interests are confined to basic, pure research, he does endorse programed learning and the use of teaching machines as advocated by Skinner. The essential requirement of programed learning is that the response one desires to strengthen be made to occur and then be followed *immediately* by occurrence of a reinforcer. Programing requires a student to compose an answer to a question and then, if he is correct, provides him immediately with reinforcement. Programing keeps high the probability that responses will be appropriate, and this insures frequency of reinforcement.

According to Spence, application of the law of effect—reinforcement—is the primary principle behind the use of programed learning and teaching machines. He states that the law of effect is the ". . . one law that seems to me to have held consistently in all of our experimental studies of learning, no matter what the complexity of the situation. . . . responses accompanied or followed by certain kinds of events (called reinforcers) are more likely to occur on subsequent occasions, whereas responses not followed by this class of events subsequently show a lessened probability of occurrence."[39] Thus, programed learning is to be based on the law of effect.

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[38] See Chapter 4, page 97, for a description of secondary reinforcement.

With the advancement of programed learning and the use of teaching machines, Spence predicts a change in the function of teachers. A primary duty of teachers will be that of inculcating interests and goals in students; these will serve both as secondary reinforcers and incentive motivators. He further states that acquisition of secondary reinforcing and incentive motivational properties by stimulus events is a fairly simple kind of classical conditioning about which we possess a considerable amount of knowledge.[40]

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[39] Kenneth W. Spence, "The Relation of Learning Theory to the Technology of Education," *Harvard Educational Review,* Spring, 1959, p. 93.

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CHAPTER 7

What is the cognitive-field theory of learning?

CHAPTERS 2, 3, and 4 are devoted to discussion of some possible descriptions of how man learns. In Chapter 2 readers are introduced to *mental discipline, natural unfoldment,* and *apperception.* These three outlooks toward learning, although now seldom promoted in teacher education institutions, continue to be reflected in many present-day school practices. In Chapters 3 and 4, the two major contemporary families of learning theory, S-R association and Gestalt-field theory, are described in a general way. Chapters 5 and 6 describe two systematic examples of the S-R associationist family, Skinner's operant conditioning and Spence's quantitative S-R theory. This and the succeeding chapter present a representative of the Gestalt-field family, the cognitive-field theory or psychology of learning. Cognitive-field theory or psychology is based upon the thinking of the late Kurt Lewin. Some of the others who have made contributions to the theory are Roger G. Barker, Ernest E. Bayles, Morris L. Bigge, Boyd H. Bode, Jerome S. Bruner, Arthur W. Combs, John Dewey, Donald Snygg, Edward C. Tolman and Herbert F. Wright.

Lewin, a native of Germany, received his doctorate at the University of Berlin, where he was later professor of psychology and philosophy. In 1932 he came to the United States. He taught at Stanford, Cornell, and Iowa, and in 1944 became director of the Research Center for Group Dynamics at the Massachusetts Institute of Technology. His students now are working at the Research Center for Group Dynamics at the University of Michigan and at Duke, Kansas University and other institutions.

The cognitive-field theory represents a relativistic, as opposed to an absolutistic, mechanistic way of viewing man and the learning process. Readers are warned that should they attempt to understand its concepts mechanistically, they will not grasp this theory. A mechanist attempts to explain all the fullness and variety of a universe in terms of machine-like objects and movements. Thus, a mechanist in psychology reduces all human activities to movements, usually in terms of stimuli and responses. He considers a person an organism which is a product of its unique history of stimulus-response patterns. Just as an automobile is built by workmen who assemble its respective parts, a person is educated by teachers who feed into his physiological make-up the various aspects of environment which supposedly make him what mechanistic teachers want him to be.

The basic principle of *relativism* is that nothing is perceivable or conceivable as a thing-in-itself. Rather, everything is perceived or conceived in relation to other things. That is, a thing is perceived as a figure against a background, experienced from a given angle or direction of envisionment. Consequently, relativism means that psychological reality is defined, not in "objective," physical terms, but in psychological, perceptual terms. So defined, reality consists of what one makes of that which one gains through one's senses or otherwise.

See if you can get the point of this story. What is the significance of the third umpire's statement? What makes a ball a ball and a strike a strike? "The story concerns three baseball umpires who were discussing the problems of their profession. The first umpire said, 'Some's balls and some's strikes and I calls 'em as they is.' The second umpire said, 'Some's balls and some's strikes and I calls 'em as I sees 'em.' While the third umpire said, [I sees 'em comin' across and] 'some's balls and some's strikes but they ain'*t* nothin' till I calls 'em.' "[1]

The cognitive-field theory of learning is closely related to, and derived from, *cognitive* and *field* psychological theories.[2] *Cognitive* is derived from the Latin verb *cognoscere,* which means "to know." Cognitive theory deals with the problem of how people gain an understanding of themselves and their environments and how, using their cognitions, they act in relation to their environments. Field theory centers on the idea that all psychological activity of a person occurs in a field; it is a part of a totality of coexisting factors which are mutually interdependent.

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[1] Hadley Cantril, "Perception and Interpersonal Relations," *American Journal of Psychiatry,* August, 1957, p. 126.

[2] See Gardner Lindzey, *Handbook of Social Psychology,* Addison-Wesley, 1954, Vol. 1, chaps. 3 and 5.

A field consists of the concurrent interrelationships in any one situation. A field situation is perceived in such a way that any change in the field depends upon the field at that time. An astronomer uses "field" to describe the universe and predict the orbit of stars. A biologist relates the function of cells to their location in a growth "field." A physicist uses "field" in his study of the structure of an atom. To a psychologist "field" means the total psychological world in which a person lives *at a certain time.* It includes matters past, present and future, concrete and abstract, actual and imaginary—all interpreted as simultaneous aspects of a situation.

A cognitive-field theory of learning often is called merely *field theory*. However, since it describes how a person gains understanding of himself and his world in a situation where his self and his environment compose a totality of mutually interdependent, coexisting events, *cognitive-field* is more truly descriptive of the learning process. Within cognitive-field theory, learning, briefly defined, is a relativistic process by which a learner develops new insights or changes old ones. In no sense is learning a mechanistic, atomistic process of connecting stimuli and responses within a biological organism.

Insight, concisely defined, is a basic sense of, or feeling for, relationships. Although there is nothing about the term "insight" which requires it to be right in any absolutistic sense, it is a grasp of a thing which often does go deeper than words. Thus, it is a realizing sense of a matter. Insight into a matter is its meaning. Meaning, so used, denotes that to which a matter or idea points or what it signifies. The insights of a person are not equated with his consciousness or awareness or his ability to describe them verbally; their essence is a sense of, or feeling for, pattern in a life situation.

During World War II, the author watched a group of "noncoms" teaching recruits in basic training to fire Army rifles (the author was one of these "rookies"). Army rifles have a powerful recoil or kick. A soldier is supposed to "squeeze" the trigger gradually and smoothly until the rifle fires. Recruits usually anticipate the recoil and jump before the shell explodes; thus, their aim is completely spoiled. The problem for a noncom was to teach his "pupil" not to make the anticipatory jump. Recruits were convinced that they really did not jump until after the explosion, and thus hours of blankety-blankety-blanks had little, if any, effect. Corporal Jones helped his "pupil" gain an insight. He "scolded" him several times for jumping, with no avail. Then while his pupil's attention was diverted to a fellow sufferer, the corporal slipped a fired cartridge into the firing chamber. The recruit aimed, started to squeeze, and again jumped out of his skin. He thereby gained an insight. He was jumping before his rifle fired and thus ruining his aim. His jumping before the rifle had fired then ceased.

Cognitive-field psychology explains development of insight as change in cognitive structure of a life space. To think of learning as development of insight and apply the thinking to school situations most advantageously, we need a psychological structure upon which to build our thinking. This is provided by cognitive-field psychology. A person's insights collectively constitute the cognitive structure of his life space. *Cognitive structure* means the way a person perceives the psychological aspects of the personal, physical, and social world. Such a world includes a person and all of his facts, concepts, beliefs, and expectations. Consequently, the cognitive structure of life spaces figures in development of language, emotions, actions and social interrelations (see pages 204–212 for definitions of key concepts of cognitive-field psychology).

WHAT IS COGNITIVE-FIELD PSYCHOLOGY?

Lewin considered psychology a science closely related to everyday life. He wanted most of all to study the various problems of the social sciences involving minority groups, political organizations, and international and intercultural relations. In the course of applying his psychological theory to problems in these areas he became interested in "teaching" and "learning." In keeping with his interests, he developed some new problems for psychology and was highly creative in his methods for solving them. As a leader in development of methods of group dynamics and action research, he thought that actual experiments with groups could be performed under precisely controlled conditions. His study of the effects of various social climates on youth is an example of an experiment in group dynamics. This study was conducted with groups of boys in a boys' club. By means of the relationship of a leader to his respective group, anarchic, autocratic, and democratic social climates were experimentally developed. Careful note was made of the behaviors of the boys in each social climate. The process required to change the social climate of a group from one form to another also was studied.[3] In many circles, action research has become an accepted method of scientific procedure; group studies are so performed that key individuals in the social situation being investigated, through serving as recorders, observers, and analyzers, actively participate in conducting the study. Through this method, teachers may systematically study the student-teacher relationships which exist in their own school.

The center of Lewin's psychological interest was in the motivating conditions of person-environment situations. Furthermore, he was extremely interested in democratic principles and practices. It is no accident that his psychological system provides a foundation for a psychology of learning germane to American democratic society. Although field theory is applicable to all fields of psychology, it is particularly useful in social, personality, and educational psychology.

Lewin thought that during its development psychology somehow had missed much of what was at the heart of scientific modes of thought. He was convinced that the various S-R associationisms represented an inadequate approach to the study of psychology. Thus, he developed his "field psychology" in such way as to make it fundamentally different from the various S-R associationisms. Whereas S-R associationisms study psychology as a series of events, the very term "field" of field psychology implies that, psychologically interpreted, everything happens at once.

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[3] See Kurt Lewin, *Resolving Social Conflicts,* Harper & Row, 1948, pp. 71–83.

Lewin's goal was to make the concepts of field psychology of sufficient scope to be applicable to all kinds of behavior and yet specific enough to permit representation of a definite person in a concrete situation. He observed that conventional laws of S-R associationistic psychology are based on statistical predictions, and that statistical predictions may apply to the average of children or to the typical behavior of an age group, but they do not anticipate what a given person will do in a specific situation. He thought that objectivity in psychology demanded representing the field adequately and accurately as it exists for an individual at a particular time. Consequently, to be objective in psychology one must be subjective; one must observe situations as the person being studied views them.[4]

In 1958 Gardner Murphy wrote, "For it was the genius of Kurt Lewin that gave us the most appropriate tools for analyzing this problem of the diversity of human natures and the correlative problem of the flexibility, the range, the potentialities of human natures, both as they may take shape in the world of today and as future human societies may know them."[5]

What Is the Method of Cognitive-Field Psychology?

Lewin's field psychology more precisely is called *topological and vector* psychology. In developing his psychology he borrowed ideas and concepts from other disciplines, namely, geometry and physics. Key concepts which he borrowed were "topology" from geometry and "vector" from physics. In using these and related concepts, he did not adhere rigidly to the definitions of their mother sciences, but construed them in a manner most useful to his system of psychology.

Some scientists have criticized Lewin for giving these terms a somewhat different meaning from what they have in other areas of knowledge. Lewin has answered their criticism by stating that scientists in any area should use any concept in the ways that lend themselves most effectually to pursuit of their problems. Relativists encourage cooperation among all scientific endeavors, but they do not insist that any area of science be restricted by the specific laws, principles, concepts, and definitions of a sister science.

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[4] See pages 183–184 of this chapter.

[5] Gardner Murphy, *Human Potentialities*, Basic Books, 1958, p. 302.

Through use of topological and vector concepts, Lewin pictured psychological reality in terms of field relationships of a person and his environment. In so doing he applied the method of field theory as it had been developed in the physical sciences. However, since concepts of the physical sciences did not lend themselves to a science of psychology, he did not use the same concepts and facts as did field theorists in sister sciences.

Topological and vector psychology provides a paradigm or model called life space which is used in studying people psychologically. Topological ideas or terms—constructs—illustrate the position of a person in reference to his functional goals and the barriers to their achievement. Thus, topology shows the various possibilities for psychological behavior or locomotion.

Vectors indicate the moving forces within a topological structure; they picture what is happening or likely to happen. Hence, vectors indicate the valences of respective regions—functional parts—of a life space. Valences are the attracting or repelling powers of regions; they may be either positive or negative. Goal regions have either positive or negative valences; barrier regions have only negative ones. Each vector, then, represents a force which correlates with the valence of a region of the life space; it is drawn as an arrow which shows the respective force's direction, strength, and point of application. (See Figure 7.1 on page 193 for an illustration of a life space, and pages 192–203 for expansion of the meanings of the constructs introduced in this and the preceding paragraph.)

What Is the Role of Theories and Laws in Cognitive-Field Psychology?

In contrast to the professed practice of many S-R associationists, including Skinner, Lewin made much use of hypotheses and theories. To him, scientific method included not only the processes of observation and classification of data, but also formulating and testing hypotheses. Letting the facts speak for themselves was not enough. He wanted to develop considered hunches and see whether they would check out. Consequently, collection and classification of behavioral facts was deemed an inadequate process for answering questions involving conditions and causes of events. Lewin agreed with S-R associationists that research should begin with careful observation. However, since he emphasized the importance of inferring the motives of people being studied, his observation was done in a different way and for a different purpose.

> Only with the help of theories can one determine causal interrelationships. A science without theory is blind because it lacks that element which alone is able to organize facts and to give direction to research. Even from a practical point of view the mere gathering of facts has limited value. It cannot give an answer to the question that is most important for practical purposes—namely, what must one do to obtain a desired effect in given concrete cases? To answer this question it is necessary to have a theory, but a theory which is empirical and not speculative. This means that theory and fact must be closely related to each other.[6]

Lewin's purpose was to formulate laws—relationships—predictive of behavior of individual persons in their specific life spaces. He was convinced that in order to understand and predict behavior, one must consider a person and his environment a pattern of interdependent facts and functions. Furthermore, he regarded as lawful all events which occur in a person's life space, even those occurring only once. Thus, instead of placing emphasis on a mathematical average of as many different cases as possible, he centered attention on careful, full descriptions of particular person-environmental situations. "The general laws of psychology are statements of the empirical relations between these constructive elements or certain properties of them. It is possible to construct an infinite number of constellations [life spaces] in line with these laws; each of these constellations corresponds to an individual case at a given time."[7]

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[6] Kurt Lewin, *Principles of Topological Psychology*, McGraw-Hill, 1936, p. 4.

[7] Kurt Lewin, *Field Theory in Social Science*, Harper & Row, 1951, p. 61.

What Are Some Essential Features of Cognitive-Field Psychology?

There are some features of field psychology which make it distinctly different from any of the mechanistic psychologies. The foremost of these features is its relativistic approach to the study of perception and reality. Other important characteristics are interpretation of intelligent behavior as purposive, emphasis upon psychological functions rather than objects, a situational as opposed to a historical point of view, and stress upon the principle of contemporaneity. We expand each of these points in the following sections.

PERCEPTION AND REALITY DEFINED RELATIVISTICALLY. Interaction is a concept which best characterizes the functional nature of the process within which a person perceives himself and his environment. The basic principle of *interactionism* or *relativism* is that nothing can be perceived or experienced as a thing-in-itself, but only as it is related to other things. The "reality" with which a person interacts consists of what he *makes* of the things that he gains through his senses or any other sources available to him. The meaning of any object arises from one's interpretation of the relationship between the object and oneself. When one interacts with an object or activity, he sizes it up. When a child sees a tiger as a kitty, psychologically it is a kitty; and a kitty, which adults call a tiger, is a part of the child's psychological environment.

According to the cognitive field position, the only reality a man can ever know, or work with, is his own interpretation of what is real. Thus, for an individual, reality is what he gains through his five-plus senses and his manner of sizing it up. Consequently, the field, or life space, which influences an individual is described, not in "objective," physical terms, but in the way it exists for that person at that time. There is no attempt to relate behavior to a biological organism and its physical or geographical environment as such; in field psychology, the psychological concept *person* is much broader than is the biological concept *organism*. A life space or field consists of the content of an individual's perception. Neither the organism nor the environment alone is the one main factor. Rather, a person and his environment are simultaneously interacting and participating in perception; they constitute an SMI (simultaneous mutual interaction).

Perception, here, is interpreted in its broadest possible sense. It does not mean mere consciousness. There is evidence from observation of human and animal behavior that one cannot use consciousness as the sole criterion of what is a part of a life space. A child playing in his yard behaves differently when his mother is home and when she is out, yet he probably at no time verbalizes—is specifically conscious—of her being home or away. Children in a schoolroom with Teacher A conduct themselves quite differently from when they are with Teacher B. Yet they may at no time consciously formulate the two patterns of behavior. Likewise, dogs and other animals size up situations and do the best they can for themselves; however, there is little if any evidence that in so doing they carry on a conscious process. Perception, then, must be construed to cover all the different ways one has of getting to know his environment.

In *apparently* the same situation, a person at different times may perceive quite different aspects of a situation and behave accordingly. Furthermore, provision of opportunity for one to perceive certain aspects of a physical or social environment in a certain way by no means guarantees that that particular perception will occur or that the perception which does occur will have anything like a one-to-one relationship to the objective environment as it appears to someone else. Drs. Adelbert Ames, E. Engel, and Hadley Cantril have performed experiments at the Institute for Associated Research, Hanover, New Hampshire, which show that in perception nothing is absolutely fixed. Rather, one interprets everything in terms of the situation as a whole. What one perceives—one's reality—consists of what one makes of what seems to be oneself and one's environment. Depending on the habits—insights or understandings—a person brings to a particular occasion, he seems to give meaning and order to things in terms of his own needs, abilities, and purposes.[8]

A description of two experiments performed at the Hanover Institute will give some idea of the nature and significance of these studies. Dr. Engel was curious to see what would happen when a person viewed two different pictures through a stereoscope. One set of his "stereograms" consisted of pairs of small photographs of football players, one to be viewed by the right eye, the other by the left. There was enough similarity in the pairs of pictures for a subject to get binocular fusion. However, when a person looked into the stereoscope and described the face he saw, it was neither of the faces represented by the photographs. Instead, he described a new and different face, usually made up of the dominant features of both faces he was viewing with separate eyes.

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[8] These experiments are summarized in Alfred Kuenzli, *The Phenomenological Problem,* Harper & Row, 1959, chap. 8.

Dr. Cantril reports experiments with a pair of stereograms. Each stereogram was a photograph of a statue in the Louvre; one the Madonna with Child, the other a lovely young female nude. A typical viewing of the pair of stereograms proceeded as follows: The subject first saw only a Madonna with Child, then a few seconds later exclaimed, "But my—she is undressing." She had somehow lost the baby she was holding and her robe had slipped from her shoulders. Then in a few more seconds she lost her robe completely and became the young nude. Sometimes the process is reversed. Other people never see the nude and others never see the Madonna. Apparently, what a person "sees" in a situation depends upon his needs, abilities, purposes, and insights, as well as upon what is "out there."

Since reality, relativistically defined, consists of what one gains through his five-plus senses and his manner of sizing it up, one's person is what he makes of himself, and his environment consists of what he makes of that which surrounds him. In keeping with his relativistic outlook, a field psychologist shuns the use of concepts implying fixed traits or rigid habits of personalities. He recognizes the difficulty of man's ever getting outside himself sufficiently to make final statements about what is absolutely real or true. Since he regards truth as tentative and instrumental (not final), he shies away from making dogmatic statements about the nature of man and the universe. Rather, a statement is considered true because of its accuracy in prediction and the consensus of people competent in its area in regard to the possible consequences of acting on it—

its usefulness. It should be emphasized here that a relativistic definition of truth in no way discounts the value of truths. Rather, it supposedly defines truth in a more discerning manner.

PURPOSIVENESS OF BEHAVIOR. Cognitive-field psychology is a purposive psychology; it assumes that intellectual processes are deeply affected by an individual's goals and that learning activity, including habit formation, is goal directed. Goal or purpose, therefore, is central to cognitive-field learning theory. This contrasts sharply with S-R associationisms, which either ignore goal or purpose completely or make it only peripheral and incidental. Associationists have tended to consider any concept of goal direction or purposiveness as teleological. To them, "teleological" means deriving present behavior from the future. Consequently it sounds mystical and superstitious. Thus, associationists have placed emphasis upon past events as the cause of present behavior. Since field psychology is goal centered, cognitive-field theorists inveigh against use of such mechanistic terms as "reflex arc," "connectionism," "conditioning," "associationism," and "reinforcement."

Within cognitive-field psychology, "purposive" is nearly a synonym for "intelligent." A unique characteristic of human beings is their capacity to pursue long-sighted, as well as short-sighted, self-interests. Field psychologists recognize the significance of this fact. When a child is behaving purposively, he is pursuing his goals in light of the insights he has available; he is behaving intelligently. The goal or goals toward which a child strives psychologically exist in his present life space. The phenomenon of goal is such that expectation—not actual realization—is its essence. Although the content of a goal may be in the future or may not occur at all, this goal as a psychological fact necessarily lies in the present life space. A student's goal to become a teacher is a goal toward teaching as he now sees it. This goal may be a far cry from teaching as it eventually is experienced.

The *purposiveness* of cognitive-field psychology is immanent in —operating within—not transcendental to—extending beyond—the world of experience. It prevails in workaday life situations. That is, careful study of children, as well as of other animate beings, in life situations indicates that if they are active at all they are trying to do something, and that, through our anticipating what they are trying to do, we can predict most accurately what they are going to do. Whether there is transcendental—supernatural—purpose in the universe is another problem which is related only indirectly to the concept "purposive" as developed in field psychology. Relativistic purposiveness is immanent.

Objects and events are not neutral to a child; they have an immediate psychological effect on his behavior. Psychologically, the nature of things and events is determined by their appearance and functional possibilities. Lewinian psychologists identify the imperative or challenging facts of an environment as its *valences*. For a particular child, psychological facts may include dogs, cats, rooms, chairs, knives, friends, things that fall down, things that turn over, things that start and go, things that take one places, things that go up and down, places where one is safe from danger, and places where food is available. These things and events attract a child to play, sit, eat, ride, climb, hide, and manipulate. It is in connection with these psychological functions that valences or attractions of objects and activities derive their strengths. Valences are the aspects of an environment which make it attractive or repulsive.

The valence of an object or activity usually arises from the object's being a means of satisfying a need. Thus, the valences of factors of one's environment determine the direction of his psychological development or movement. It is a person's interaction with his environment that gives a thing valence. The valence of an environmental object and the needs of a child are correlative. The particular objects or activities which bear valences, and the strengths of their valences, are quite different for a baby, a kindergartner, an adolescent, and an adult. A child's insistence on independence in some activity indicates that that activity has taken on a definite valence and that a part of the child's goals has become the enhancement of his "self." A child of three trying to jump down a step may refuse help. The step, to him, has a definite valence. Unless he reaches certain results by his own effort, he will not be content. This is evidence of emergence of a self—of his psychological development.

By means of experimentation readers may observe how, through a person's ego or self-involvement, valences of his activities arise along with corresponding personal needs. The experiment may involve any activity of such nature that the subject can set goals of differing degrees. The activity might be high-jumping, distance swimming, or making a chain of paper clips. Ask the subject what he thinks he will achieve, and place his goal at that level. (Permit the subject to compete with himself and provide his own motivation; do not say, "How far do you think you can go?") The subject's goal is the cross-bar placed at a certain level on the standards, the spot to which he hopes to swim, or the number of clips he will assemble in five seconds. As the subject makes tries and sets new goals, a relationship will develop between what he achieves in one trial—his *level of achievement*—and where he sets his next goal—his *level of aspiration*. He will set his goal at a point which he thinks he might achieve but is not certain that he will. If he falls far short he will lower his goal. If he reaches his goal he will raise it the next time.

A person, if left to decide for himself, will set his goal at a point which he thinks he probably, but not surely, can reach. Since there is a possibility of failure, accomplishment of the goal will give him a sense of success; for success to be success there must be a possibility of failure. When left to choose between several goals a person will prefer the goal which is more difficult to reach, provided he anticipates a possibility of reaching it and it is not identical with other goals easier to reach. Everything else being equal, a child will prefer a toy which is slightly more difficult to reach. If, however, he is permitted to choose between tools with which to get the toy, he will prefer that tool which is in easier reach. The law of parsimony—least action—holds for psychological means but not for psychological ends. A professor walks to the campus to give himself exercise, but when he heads for the campus he cuts every corner along the way. Is he naturally lazy?

EMPHASIS UPON PSYCHOLOGICAL FUNCTION. A third important feature of cognitive-field psychology is its emphasis upon psychological functions or events as contrasted with objects or movements. A fallacy of S-R associationists, noted by relativistic field theorists, has been their tendency to describe the character of an activity by its physical aspects only and to neglect the great effect of the psychological setting. For example, experiments on satiation clearly indicate that fatigue often is largely a matter of psychological boredom, not physical tiredness. Moving one's arm in an identical way while making certain lines may have different psychological and physiological effects, according to the meaning of this activity to one. The act of repeatedly making a pattern of four lines may have become disintegrated and the arm fatigued as a result of oversatiation. Then a change of the same movements to making a different pattern of lines or a picture from these lines suffices to bring a reorganization of the activity and erase the bodily symptoms of fatigue. If the meaning of an activity is changed by imbedding it in a different context, bodily symptoms of fatigue tend to disappear.

Psychological is understood to mean in accordance with the logic of a growing mind or intelligence. To be psychological in his pursuits, a field psychologist must look at the world through the eyes of a learner. To describe a situation psychologically, one must describe the situation which confronts an individual. Such a situation is viewed as a pattern of person-environmental relationships which provide and limit opportunity. Once the person-environmental structure is established, the problem is to use constructs and methods adequate to deal with the underlying dynamics of behavior and to do this in a scientifically sound manner.

A construct is an invented idea. It is a generalized concept not directly observed but formed from data that are observed. Its purpose is to correlate a broad range of data which have some basic functional similarity, despite marked superficial differences. Need, psychologically defined, is an example of a construct. It has no length, breadth, thickness, or mass, yet it is a crucial, functional concept in studying human activity. Lewinians speak of observable data as *phenotypes* and unobservable, constructual representations as *genotypes*.

A functional definition of psychological behavior opens the way for extensive use of systematic constructs. Whereas an S-R associationist supposedly restricts his generalizations to those based on the use of "objective" data, a relativistic field psychologist knowingly uses constructs which go beyond the observable data. Constructs provide a means of bridging the gap between general laws which cannot be observed and the functions of individual persons which can be gathered as data. Thus, through the use of a few constructs the essence of an individual case can be adequately represented.

SITUATIONAL EMPHASIS. A fourth definitive characteristic of cognitive-field psychology is that a study always begins with a description of a situation as a whole—the field—and proceeds to specific and detailed analysis of various aspects of the situation. At no time are aspects of a field viewed as isolated elements. In the study of a life space with its various constructs, the idea constantly is kept to the forefront that no two constructs or concepts are mutually exclusive, but that everything to some degree and in some sense is dependent upon everything else. Readers again are cautioned that, should they slip into giving the constructs independent physical or biological existence, they will be attempting to understand a relativistic psychology in mechanistic fashion.

PRINCIPLE OF CONTEMPORANEITY. The fifth essential feature of cognitive-field psychology is the one most often misunderstood. Contemporaneity literally means all at one time. A psychological field or life space is a construct of such nature that it contains everything psychological which is taking place in relation to a specific person at a given time. The unit of time, microscopically viewed, is a moment; however, macroscopically considered, it may cover hours or even weeks. Whatever the length of time, everything is going on at once—that is the meaning of "field." Readers are urged neither to reject the concept of contemporaneity summarily nor to give it an oversimplified interpretation.

Use of the concept *psychological field* implies that everything which affects behavior at a given time should be represented in the field existing at that time, and that only those facts can affect behavior which are part of a present field. A person's psychological field which exists at a given time contains, as well as the environment of the present, the views of that individual about his future and his past. It should be emphasized that any psychological past or psychological future is a simultaneous part of a psychological field existing at a given time. Psychologically, there is no past or future except as it enters into the present. "Since neither the [physical] past nor the [physical] future exists at the present moment it cannot have effect at the present."[9]

An individual's views about the past, as about the rest of the physical and social world, are often incorrect; nevertheless they constitute a significant psychological past in his own life space. Furthermore, the goals of an individual as a psychological fact lie in the present and they too constitute an essential part of his life space. The content of the goals may lie in the future and they may never occur. The nature of an expectation is not dependent upon the event's coming to pass. If an Indian warrior were brave so that in the future he would go to the happy hunting ground, whether or not there actually existed a future happy hunting ground would have no bearing on his being brave. His happy hunting ground is a part—a goal region—of his contemporaneous life space.

The principle of contemporaneity means that psychological events are determined by conditions at the time behavior occurs. One cannot derive behavior from either the future or the past as such. Both S-R associationists and field psychologists see little basis for future cause of events. However, field psychologists differ sharply from S-R associationists in their insistence that derivation of behavior from the past is equally metaphysical—beyond the realm of science. Since past events do not now exist, they, as such, can have no effect on the present. Thus, influence of a future can be only anticipatory, and effects of a past can be only indirect. However, through continuity of life spaces, past psychological fields do have their "trace" —residue—in a present field which influences a person's behavior. *Trace* is a region or condition of a present life space which has similarity to a characteristic of earlier life spaces. In other words, "trace" means that there is some similarity of regions of succeeding life spaces. When a person uses an earlier acquired insight in solving a current problem, the insight is an example of trace.

The principle of contemporaneity has definite implications for education. When through continuity the past enters into the present, knowledge of the past and its heritage is of great value and significance. However, the practice of making records and remains of the past *in themselves* the central materials of education cuts the vital connection of present and past. Thus, it tends to make the past a rival of the present and the present a more or less futile imitation of a past which can never be known in its absolutely exact form. Lewin's principal construct to represent a contemporaneous situation is *life space.*

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[9] Kurt Lewin, *Principles of Topological Psychology*, McGraw-Hill, 1936, p. 35.

WHAT IS A LIFE SPACE?

Life space is a scientific formulation developed for the purpose of expressing what is possible and impossible in the life of a person and anticipating what is likely to occur. It represents the total pattern of factors or influences which affect behavior at a certain moment. Behavior means any change in a life space which is psychological—in accordance with a growing intelligence.

A person's life space is his psychological world or contemporaneous situation. It includes a *person* and his *psychological environment*—that part of his physical and social environment with which he is psychologically engaged at a juncture of a moment, or longer duration, because it is relevant to his purposes at that juncture. A life space represents not physical objects as such, but functional and symbolic relationships; thus, it includes not only presently perceived objects but also memory, language, myth, art, anticipation, and religion. A continuous series of overlapping life spaces represents the total psychological world in which a person lives. This psychological world may include the person's precepts, knowledge and beliefs; his forward and backward time perspective; and abstract ideas as well as concrete objects.

Lewin's basic formula is $B = f\ (P, E)$; *B,* behavior is the *f,* function of *P,* psychological person, and *E,* psychological environment. A psychological person and his psychological environment, so formulated, constitute a life space. A life space or psychological field is not defined in terms of mere consciousness or awareness; neither is it an organism in an environment. Rather, it is a dynamic whole of such nature that a change in any part affects other parts, and every change depends upon the whole; it is a totality of coexisting events. Psychological person and psychological environment are not mutually exclusive; however, they may be considered to function as subwholes of a psychological field or life space. A life space is surrounded by a *foreign hull*—the aspects of the physical and social environment which to that person at that moment are not psychological. The foreign hull of a life space consists of all the potential perceptions as contrasted with the functional perceptions of a person's unique field.

A life space is made up of a large number of regions. These are various kinds of conditions, places, things, and activities which are psychologically significant. They all are defined functionally; not as substances. They include such objects and activities as automobiles, friends, playing football, flying into space, having a pain, and behaving religiously. Regions that are attractive have a positive valence; those which are repulsive have a negative one. Regions may be reached through physical, social, or imaginative locomotion (see page 224 for a description of regions and page 211 for an explanation of locomotion).

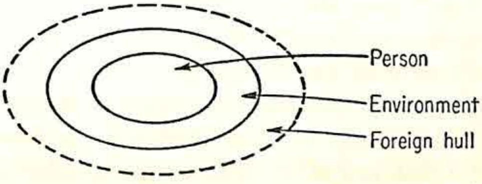

FIGURE 7.1 *A Life Space.*

In a life space, a person and his environment are in simultaneous mutual interaction (SMI) and are mutually interdependent. Each depends upon the other for its nature and functions; it is impossible to treat one adequately without also treating the other. One's person is definitive of one's environment and likewise one's environment is definitive of oneself. A person, his environment, and the foreign hull of his life space may be represented by concentric figures. A person is within his environment and both are within the foreign hull as shown in Figure 7.1.

A life space usually is represented by related geometric figures.

However, it is important to keep in mind that the essence of life space is its functional nature; it represents, not physical entities, but functional relationships. It constitutes an instrument whereby one may be objective in studying student behavior by being, to some degree, subjective. A teacher may think, "What would I be thinking if I were a student and were acting that way?" or "If I were in his situation why would I be acting the way he is?" A life space is, uniquely, a psychological phenomenon. All psychological events—acting, thinking, learning, hoping, dreaming—are functions, not of isolated properties of an individual or his environment, but of mutual relations of a totality of coexisting facts which constitute a life space. Life space is a technical term for a psychological situation.

What Is a Person?

Cognitive-field psychologists place one's *self* or *person* at the center of his psychological field. A self or person is that body or configuration of matters with which an individual becomes identified, of which he takes care, and to which he gives his allegiance. So defined, it is not a fixed quantity or static thing. It is *achieved,* as contrasted with being inherently possessed.

Under no circumstances is a person considered identical with an organism. Thus, a person is not limited to a mind or body; neither is it a mind and body. Rather, a person is *a consciously behaving self*. It is the center of abilities and needs; it is what a child means when he says "I" or "me." The concepts "self" and "person" are used interchangeably and may be considered synonyms. Teachers more often think of Billy Smith and Sally Anderson as persons. However, Billy and Sally, when thinking of themselves, are more likely to use the term "self." A person is in no sense an abstract ego or self which can be experienced apart from any social context. It is within the social living of an individual that a self emerges and continues to change throughout life. It may be said that the basic human need is for preservation and enhancement of this emergent self or person. One even owns a "loyal" dog in order to enhance and give constancy to his psychological self or person.

One's person grows so that soon the central feature of his social and personal motivation becomes the maintenance and betterment of the welfare of that self. A child, to a greater extent than an adult, is a dynamic unity. When he cries, he cries all over; when he is hungry, all of him is hungry; and when he is frightened, he is startled completely. Consequently, he perceives his self only as he distinguishes it from his environment and various aspects of it from one another. The rather sharp distinction between one's person and his psychological environment is something which grows in an individual's thinking, as the "I" or "self" is gradually formed.

HOW DOES A CHILD CONSTRUCT HIS SELF? His awareness of his self is manifested in at least four different ways: (1) He reaches certain results by his own efforts and comes to feel responsible for his acts, priding himself on his achievements and blaming himself for his failures; (2) his self, being embodied in values and goals, is realized in his transactions with other people; (3) as he evaluates his conduct over and against an ideal, an ideal self emerges (people often identify this ideal self with "conscience"); and (4) his self grows to a prominent place in his memories of a past and his anticipations of a future.

Learning to concentrate entails learning to separate out—or structure—certain parts of one's self and one's psychological environment, the two central aspects of one's life space. Through this differentiating process, a self grows to be a most important functional region in a psychological field. Under normal conditions an individual's self is likely to involve his strongest motives. When a child uses the term—*I, me, mine, you, yours, he* or *she, him* or *her* or *his* or *hers*—a self is emerging. Such concepts arise only as a person interacts with other individuals and groups of people. Through this interactive process each person acquires such achievements as language, conceptual thinking, and moral, social, and religious predispositions and insights.

ARE SELVES ALWAYS IN THE PROCESS OF MAKING? Insofar as one knows, a baby does not make sharp distinctions between his body, his environment, and the aspects of each. His life space is quite simple and undifferentiated. As a child lives and grows he extends his world of understanding in an attempt to have it encompass more and more of the world about him as he sees it—his world of effect, or psychological environment. In turn, the resultant extension and differentiation of his life space leads to an enlargement of his psychological environment. It is in this dynamic process that essentially different facts acquire their psychological reality. Selfhood, except as it has encased itself in a shell of routine, always is in the process of making. Any self, in process, is capable of including a number of inconsistent selves or unharmonized dispositions.

Were this not true, with man as intelligent as he is, life would be quite drab. Impulsive action in a child means he is ripe for discovery of a more inclusive and richer self which is possible but as yet unrealized. A self is in the making constantly as one develops new insights, or changes old ones, and forms new habits.

Teachers should bear in mind that a far-reaching change in structure of a self or person can occur through one's developing a significant educational insight. Acquiring a new educational insight can be as significant and far reaching as falling in love, becoming converted, or realizing a great change in physical and social environment.

Man is born a very complex biological organism in a social environment. Through actively living in a human environment he develops as a person or self. The normal process of development produces self-involvement with objects, people, groups, and social organizations in a physical and social environment. In a negative sense, a human organism growing up in complete isolation probably would not develop a self-concept or appear to others as a personality. It seems reasonable to assume that he would have no basis for distinguishing between right and wrong, he would have no developed aesthetic sense, and he would have no language or symbols and would thus be incapable of abstract thinking. Only by living in a human world and having a biological organism of unique type does he emerge a psychological person or self.

A person adjusts to his social and physical environment by identifying himself with the activities or concerns that comprise it. Thus, *self, person,* and *interests* are names for the same psychological phenomenon. The content of self is taken to consist of one's cherished ideals and interests. The kind and amount of interest actively taken in affairs is a measure of the quality of one's selfhood or person. To say that a child is interested or "concerned" is a brief way of saying that he is engaging interactively his person and his psychological world. In its widest possible sense, a child's self is the total configuration of all that he calls or thinks of as *his*. This can include his body, his speech, his thoughts, his clothes, his home, his parents, his grandparents, his brothers and sisters, his reputation in various groups, his personal property, and his attitudes toward all these and the institutions for their realization.

HOW MANY SELVES DOES AN INDIVIDUAL HAVE? In a sense, he has as many different selves as there are distinct groups for whose opinion he has any concern. Thus, Jimmy Jones at home is one self, in school another, on a date another, and on a football field still another. Every normal person maintains a variety of interests or values in different situations and so might be said to have a corresponding number of selves. Although there is a different self in each successive life space of an individual, we can anticipate a continuity of selves of such nature that, in case of conflict, a deeper continuous self pushes the others aside and claims the "right of way." Consequently, each person, if reasonably "normal," is a basic self made up of his major allegiances and commitments, among which there is some degree of harmony and continuity. Usually the psychological structure of a person is relatively constant over a long period of time, particularly as he advances in chronological age.[10]

A person may be represented as a differentiated region of a life space (see Figure 7.2). The field of a newborn baby is something like "one big blooming buzzing confusion." Then as one lives his life, although he may not think of it in these specific terms, his total situation is structured as his *self*—person—and his *environment*. Some aspects of experience involve the central core of a person; they are very near and dear to him. Others are of a less vital, peripheral sort. We may think of a person as structured in outer and inner layers. Some experiences involve only the more peripheral areas, whereas others embrace the most central regions of a psychological person.

Psychologically, a person is composed of (1) a motor-perceptual

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[10] See William James, *Psychology*, Holt, Rinehart and Winston, 1892, chap. 12, "The Self," pp. 176–215.

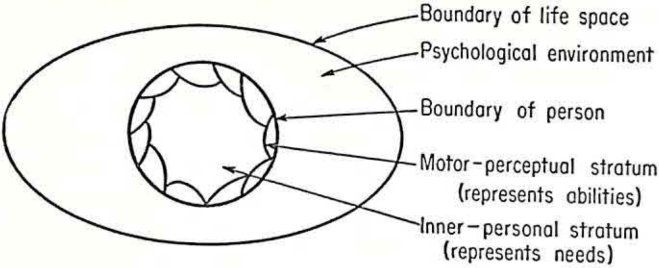
Boundary of life space
Psychological environment
Boundary of person
Motor-perceptual stratum (represents abilities)
Inner-personal stratum (represents needs)

FIGURE 7.2 *A Structured Person in a Life Space.*

stratum (region) and (2) an inner-personal stratum (region). The motor-perceptual stratum has the position of a boundary zone between the inner-personal region and the environment. It represents the knowing and manipulative abilities of a person. *Motor-perceptual system* denotes the phenomenon which a mechanist would see simply as body or organism. A mechanist, that is, would set his pattern of thinking in a physiological rather than a psychological frame of reference. In a sense, the motor-perceptual system is the tool of the inner-personal system. Like regions of the environment, it provides opportunity and limits opportunity. However, it is more closely identified with the self than is the environment.

Whereas abilities are centered in the motor-perceptual system, needs are centered in the inner-personal system. A *need* is a state of a person which has a part in determining behavior toward any goal which may exist in relation to that state; it corresponds to a personal tension. Since the motor-perceptual region is between the inner-personal region and the environment, it performs functions of both person and environment. This means that a person acts in relation to his environment and simultaneously realizes the consequences of so doing.

The form which the development of selfhood takes depends upon the interaction of a person and his environment. An organism, in a sense, is an aspect of each—person and environment. Furthermore, whether something belongs to the self or to the environment depends, among other things, upon present needs and other factors of the inner-personal region. "Needs or other states of the inner-personal regions can influence the environment only by way of a bodily expression or a bodily action, that is, by way of a region which one can call the motor region."[11]

What Is a Psychological Environment?

A psychological environment is what a person "makes of" his physical-social environment. Thus, it consists of everything psychologically outside an individual person which means anything to him. It is made up of everything in which, toward which, or away from which a person can change his psychological position. "Environment is understood psychologically sometimes to mean the *momentary situation* of the child, at other times to mean the *milieu,* in the sense of the chief characteristics of the permanent situation."[12]

HOW DOES PSYCHOLOGICAL ENVIRONMENT DIFFER FROM PHYSICAL-SOCIAL ENVIRONMENT? The physical environment of an object or person includes everything surrounding that object or person as seen by an unbiased observer. Likewise, social environment consists of the generalized social milieu or atmosphere around a person. It is the attitudes, values, and beliefs of the community, region, or nation. Although physical and social environment furnish a setting for the psychological environments of individuals in a group, they are distinctly different from the psychological environment of any one member of the group. We may never consider a child's physical or social environment as it appears to others to be his psychological environment.

Whereas the physical environments of a group of students in a classroom are relatively the same, each of their psychological environments is unique. Let us visit Miss Smith's classroom of sixth-grade students at Carbondale Elementary School. At 10:30 Tuesday morning, what is happening in the room? Miss Smith is holding reading class. What are Alice, Frank, Helen, and John doing? Alice is so absorbed with her teacher and school work that she is oblivious to everything else about her, including the other children.

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[11] Lewin, *Principles of Topological Psychology,* op. cit., p. 177.

[12] Kurt Lewin, "Environmental Forces," in Carl Murchison, Ed., *Handbook of Child Psychology,* Clark University Press, 1933, p. 592.

Frank is listening halfheartedly to the teacher but is concerned primarily with the other children in the room. Helen is a social butterfly; she wants the attention of most of the children in the classroom. She does give attention to the teacher from time to time, but right now she is concerned with other things. John's body is in the classroom, but "psychologically" John is riding a shiny new tractor which is being operated in the field adjoining the school.

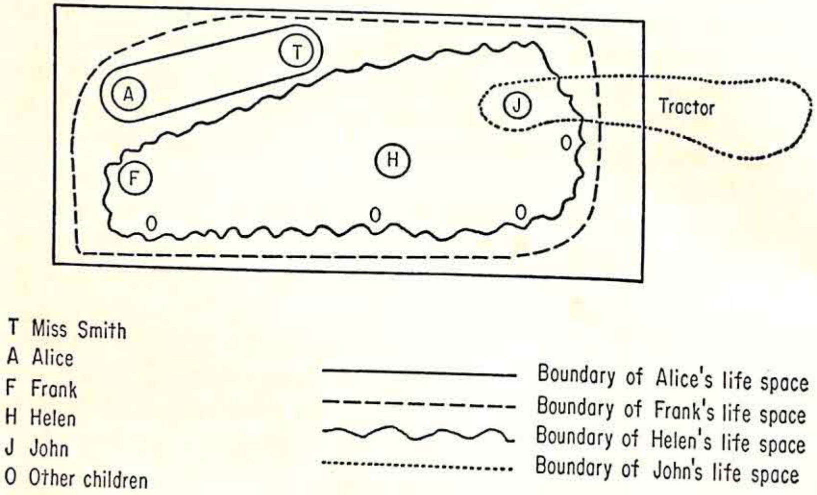
T
A
J
Tractor
O
H
F
O
O
O
T Miss Smith
A Alice
F Frank
H Helen
J John
O Other children
Boundary of Alice's life space
Boundary of Frank's life space
Boundary of Helen's life space
Boundary of John's life space

FIGURE 7.3 *Life Spaces Involved in a Classroom.*

This classroom is illustrated in Figure 7.3. Each small circle represents a person and has his initial on it. Each person has his respective environment, indicated by a larger figure which includes the person. Each person and his respective psychological environment constitute a life space. Practically everything within the four walls of the classroom, as well as much more, is included within either John's life space or his foreign hull. John's life space, drawn alone, would appear as in Figure 7.4.

Since a psychological environment, strictly speaking, is a momentary situation involving a specific person, such an environment and the person involved are constantly changing as the person actively lives in relationship to that environment. What *appears to an observer* to constitute John's environment may include many elements not actually in John's psychological environment, and the observed environment may exclude some elements which, for John, psychologically are in it. For her to understand John, the teacher must study John in *his* own environment (John's psychological environment), not *the* physical environment.

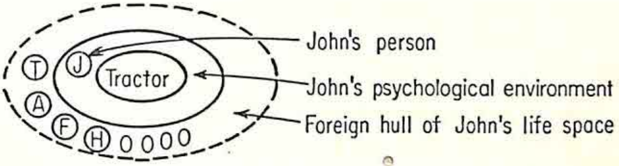
John's person
John's psychological environment
Foreign hull of John's life space
Tractor
J
T
A
F
H
0 0 0 0

FIGURE 7.4 *John's Life Space.*

Thus, to be objective in dealing with the child, the teacher must be subjective. She must see the world as John sees it. In order to predict John's behavior accurately, the teacher must understand the interactive nature of John's life space—his person and his environment—and she must be able to predict (anticipate) the boy's future life spaces. Then, for Miss Smith to be able to teach John in a significant way, it is imperative that there be some intersection of John's life space with hers and with the life spaces of other children in the room.

Is an Organism Considered Person or Environment?

In a relativistic sense, an organism is a factor of both the person and his environment. A person usually closely identifies his biological organism with himself. But he also sees his organism in another light as an important aspect of his environment; it is part of that with which he must learn to live. A child's or youth's being crippled or abnormal in physical size or proportions may color everything he says or does. A twelve-year-old girl who reaches the adolescent growth spurt early and becomes head and shoulders taller than any other student in her class may consider her physical stature a critical aspect of her psychological environment; she must live with what she "makes of" her physical stature.

We may illustrate the relation of a biological organism to a person in two different ways. The organism may be considered a boundary region of a person which mediates between the person and his environment by providing cognitive and manipulative abilities (Figure 7.5A), or the organism may be pictured as a factor common to both a psychological person and his environment (Figure 7.5B).

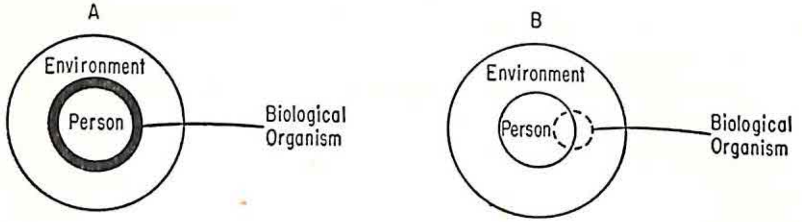

FIGURE 7.5 *Relationship of a Biological Organism to a Psychological Person.*

What Is a Foreign Hull?

A foreign hull is composed of those aspects of an organism's physical and social environment which are observable by the one studying the particular person but which at that moment have no significance for the person being studied. Thus, it is the complex of all nonpsychological factors surrounding a life space. It is made up of physical and social factors which, at the time being considered, are not subject to a person's psychological conceptualization, but which may at any time become parts of his psychological field. Thus, it is that part of his physical and social environment which, at the juncture under consideration, is not included in his psychological environment. The physical and social conditions of the foreign hull limit the variety of possible life spaces. Anything which appears to be in a child's physical environment, but of which he is completely oblivious, is in the foreign hull of his life space. However, if he reacts to that thing in any way, either positively or negatively, it is no longer in his foreign hull but in his life space proper. Should Billy have only contempt for Miss Smith, she is in his life space just as much as if he loves and respects her.

Nonpsychological factors observed only by an outsider can at the next moment become psychological for the person being studied. A characteristic of the parts of a life space and their regions is permeability. There can be movement both ways through the boundary of a person or a life space or through any of their regions. What is "self" may move into environmental regions of the life space or even into foreign hull, and vice versa. Only the inner stratum of self—needs—remains relatively stable, although it too may change drastically over time, as when a person changes his religious faith.

Since succeeding nonpsychological physical, and social environments—foreign hulls—are outside psychological environments, they can have no immediate effect upon a person's intelligent behavior. However, through interaction with the environment, parts of a present foreign hull are transformed into goals, barriers, and other psychological factors of future life spaces. They then are no longer a part of the foreign hull. Factors thus transformed become parts of subsequent psychological environments. What a moment before constituted only a part of the foreign hull may at the succeeding moment be a central part of the person or his psychological environment.

Continuity of Life Spaces

Although a series of momentary environments of a person usually are more or less similar, there is nothing fixed or static about them. As a person develops, he lives through a series of life spaces, each with its own environment and to some degree different from the one which preceded it. However, in a reasonably normal person, a new life space is not completely different from the one of the moment before. Thus, there is a continuity of life spaces.

Since, we can anticipate some degree of similarity and continuity of life spaces as the experiences of one moment shade into those of the next, for practical schoolroom procedures, depending upon the purposes being pursued, we may assume a fixity of life spaces for longer periods than a moment—perhaps a class period, a week, or a month.

Within a series of overlapping life spaces, a person's life is a continuity of psychological tensions, locomotions, and new equilibriums. When there is an increase of tension in one part of a life space relative to the rest of the system, disequilibrium occurs. When a person finds himself in a state of disequilibrium and attempts to return to equilibrium, psychic energy is expended; he engages in psychological locomotion. Should tension throughout the system become completely equalized, output of energy would cease; the total system would come to rest.

Of course, throughout a life span this absolute balance is never achieved. Since a person is intelligent and purposive, he expands and restructures his life space and consequently new disequilibriums emerge. This process gives a dynamic nature to human living which makes it immensely interesting and challenging.

WHAT ARE THE KEY CONCEPTS OF FIELD, OR TOPOLOGICAL AND VECTOR, PSYCHOLOGY?

Readers will find this section, which explains why field psychology is more specifically named "topological and vector psychology," somewhat technical and perhaps difficult. However, should they seek sharper insights into the deeper implications of field theory, this section will greatly enhance their understanding.

Lewin said, "Topological and vectorial concepts combine power of analysis, conceptual precision, usefulness for derivation and fitness for the total range of psychological problems in a way which, in my opinion, make them superior to any other known conceptual tool in psychology.[13] He felt that topological and vector, or field, psychology was characterized by a set of concepts or constructs which permitted representation of psychological reality in a highly adequate fashion. He wanted concepts broad enough to be applicable to all kinds of behavior and at the same time specific enough to represent a definite person in a concrete situation. This system implements a person's being represented as separated from and yet enclosed within a larger totality—his life space. Thus, it enables one to represent adequately a psychological situation which includes a person, his environment, his needs, his goals, and their dynamic interrelations.

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[13] Kurt Lewin, "Field Theory and Learning," in Nelson B. Henry, Ed., *The Psychology of Learning*, Forty-first Yearbook of the National Society for the Study of Education, Part II, Public School Publishing Co., 1942, chap. 6, p. 219.

For one to grasp fully the ideas of a relativistic, field psychology, it is essential that its key concepts be defined precisely as they are used in this frame of reference. In studying these concepts, readers should keep in mind the essential idea of field psychology: the meanings of all its constructs are mutually interdependent. Each depends for its meaning upon the meanings of all the others.

Furthermore, it should be remembered that a diagram of a life space is figurative. It is difficult, perhaps impossible, to show everything at once. A complete and accurate image of a life space would show all of the psychological facts and constructs in a momentary situation represented by a differentiated person and a differentiated environment. A differentiated person or environment is one structured or functionally divided into various aspects as perceived by the one being studied. Some differentiated aspects of a person are friends, ambitions, self-aggrandizement, and needs and abilities to know about various matters and to carry out activities of different kinds. A differentiated environment contains everything perceived by the person at the time under study.

Lastly we should guard against reifying or making physical things of the psychological constructs whose purpose is to symbolize relationships primarily functional in nature. For example, we should at no time think of a psychological person as synonymous with a biological organism or of a psychological and a physical environment as the same concept.

What Are the Three Pivotal Concepts of Field Psychology?

The three pivotal concepts of cognitive-field psychology are life space, topology, and vector. Whereas *life space* is treated in some detail on pages 192–204 of this chapter, the concepts *topology* and *vector* have heretofore been only briefly defined. In this section *life space* is summarized, then *topology* and *vector* are explained in greater detail.

LIFE SPACE. Life space is a model or paradigm for psychological thinking. It contains the whole of one's psychological reality—one's self and what one makes of what one gains from one's physical and social environment. It includes everything that one needs to know about a person in order to understand his concrete behavior in a specific psychological environment at a certain time. The psychological environment and the person constitute the situation as perceived by that person. Emergence of the properties of a life space depends partly upon the state of the individual as a product of a continuity of life spaces and partly upon his interaction with his physical and social surroundings.

TOPOLOGY. Topology is a nonmetrical geometry which encompasses concepts such as inside, outside, and boundary, but has no dealings with length, breadth, or thickness. No distances are defined. Rather, topology is concerned with the relative position of the geometric figures being considered. "Topologically there is no difference between a circle, an ellipse, a regular or irregular polygon with any number of sides. . . . A drop of water and the earth are, from a topological point of view, fully equivalent."[14] It is helpful to think of a topological plane figure as being made of a perfectly elastic sheet of rubber; we may stretch, twist, pull, and bend it at pleasure, but the relationships it represents remain the same.

Two basic concepts which topological space denotes are connectedness and part-whole relationships. Topologically, things may be next to, inside, or outside one another. Size or shape has no significance in a topological figure. "Two figures are *topologically equivalent* if [if and only if] one figure can be made to coincide with the other by an elastic motion."[15] The life spaces in Figure 7.6 are topologically equal. Each is a completely bounded area within a larger bounded area.

Topological concepts are used to represent the structure of a life space in such a way as to define the range of possible perceptions and actions. This is accomplished by showing the arrangement of the functional parts of a life space. The parts are shown as various

[14] Lewin, *Principles of Topological Psychology*, *op. cit.*, p. 88.

[15] Bradford H. Arnold, *Intuitive Concepts in Elementary Topology*, Prentice-Hall, 1962, p. 24.

regions and their boundaries. When an individual structures—makes sense of—his life space, he divides it into regions.

In addition to the person whose life space is being studied, regions represent activities like eating, going to the movies, and making decisions; more passive incidents like being fired or being rewarded; and social entities such as family, church, school, and gang. If the region "going to the movies" is located in a person's life space, the person is either engaging in or thinking about engaging in that activity. If "being fired" is in his life space, he is perceiving that incident and its consequences. "Church" in a life space involves what one makes out of what "church" means to him.[16]

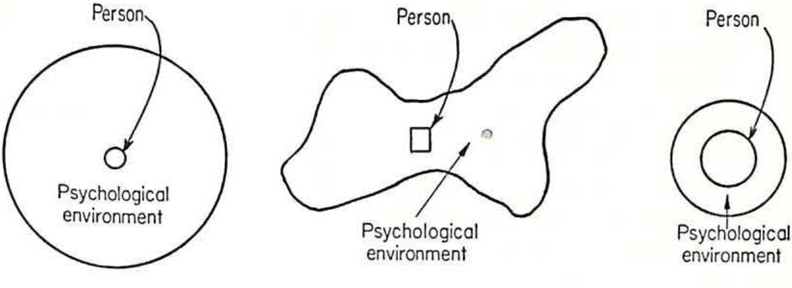
Person
Psychological environment
Person
Psychological environment
Person
Psychological environment

FIGURE 7.6 *Topology of Life Space—Three Equal Figures.*

VECTOR. The concept *vector* is borrowed from a system used in mechanics to represent direction and strength as two of the three properties of a force. The third property is its point of application. In psychology a vector represents a force which is influencing movement toward or away from a goal (see Figure 7.7). A force is a tendency to act in a certain way or direction. A vector is a concept equivalent to, and descriptive of, a psychological force. If there is only one vector—force—there is locomotion in the direction toward which the vector points. However, if two or more vectors are pointing in several different ways, movement is in the direction of the resultant force.

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[16] See Dorwin Cartwright, "Lewinian Theory as a Contemporary Systematic Framework," in Sigmund Koch, Ed., *Psychology: A Study of a Science,* McGraw-Hill, 1959, p. 25.

Whereas topological concepts are used to illustrate structurally what is possible, vectorial concepts describe the dynamics of a situation—what is happening or is likely to happen. Thus, vectors deal with the tendencies of a life space to change or resist change. In an illustration of what is happening or likely to happen, a vector may represent either a driving or a restraining force. A driving force is a tendency to change or move. A restraining force is a barrier or obstacle to psychological locomotion, which opposes some driving force. Both driving and restraining forces may arise from the needs and abilities of the person being studied, from actions of another person, or from the impersonal aspects of a situation.[17]

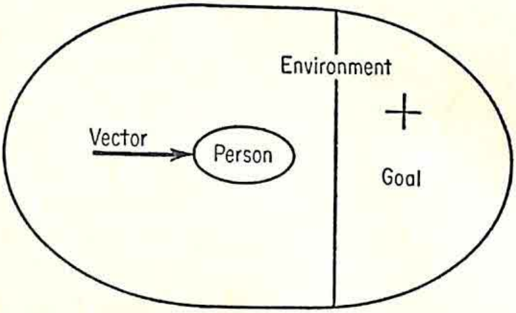

FIGURE 7.7 *A Vector.*

What Are the Key Auxiliary Concepts of Field Psychology?

The pivotal concepts—life space, topology, and vector—and ideas auxiliary to the basic formula—$B = f\ (P, E)$—are illustrated in Figure 7.8. The latter are described in the following glossary of key auxiliary concepts of field psychology. These elements of construction represent ideas, not "objective" self-evident phenomena.

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[17] See Chapter 11, pp. 336–337, for an application of vectorial concepts to teaching.

An analysis of the structure and dynamics of the life space of a child in school will reveal numerous interdependent aspects of the situation, such as the child's relationships with his teacher and other students, the social pressures arising from his family, and even the consequences of his family's relations with other families. All of these various factors of a situation may be expressed through the use of the key pivotal and auxiliary concepts of field psychology.

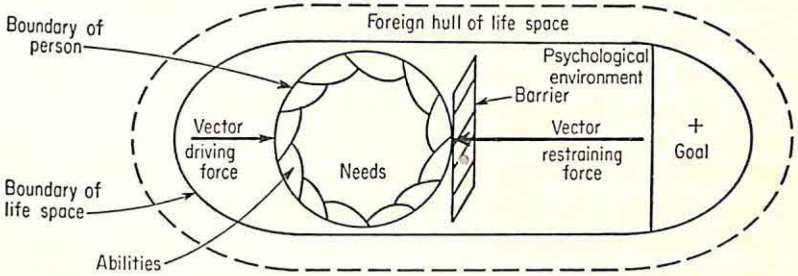

FIGURE 7.8 *Life Space of an Individual.*

Key Auxiliary Concepts of Field Psychology

Person. A consciously behaving self. Center of abilities and needs. That which a child means when he says "I" or "me."

Person-centered constructs.

Needs. States of a person which, if they exist in relation to a goal, have a part in determining behavior toward that goal. Correspond to a tension system of the inner-personal region of a person.

Abilities. Cognitive—capacity to know environment. Executive—capacity to manipulate environment.

Environment. Everything in which, toward which, or away from which a person can make psychological movement—do anything about. Person and environment are mutually dependent upon one another.

Foreign hull of life space. Complex of all nonpsychological facts which surround a life space. That part of a person's physical and social environment which, at a particular moment, is not included in his psychological environment. Physical and social raw materials. Foreign hull limits behavioral possibilities.

Cognitive structure. An environment, including a person, as known by the person. Synonyms are *insight* or *understanding.* Has one dimension—clarity.

Valences. Positive or negative imperative environmental facts. Properties which regions of a life space have if an individual is drawn toward them or away from them. A region which possesses a positive valence is one of such nature that forces correlated with the valence of that region tend to move the person in the direction of that region. A negative valence means that forces tend to move the person away from that region.

Tension. Very closely related to, and descriptive of, psychological needs. The state of one system relative to the state of surrounding systems. Either created as a result of opposed forces or induced by internal physiological changes or external stimuli. Release of tension may be achieved either through reaching a goal or through restructuring the life space.

Goal. A region of valence. A common region toward which forces within a life space point. Region of life space to which a person is psychologically attracted.

Barrier. Dynamic part of an environment which resists motion through it. That which stands in the way of a person's reaching his goal.

Force. Immediate determinant of the locomotions of a person. The tendency to act in a certain direction. Its properties are strength, direction, and point of application. It is represented by a vector. The strength of a force is related to, but not identical with, the strength of a valence. The combination of forces acting at the same point at a given time is a resultant force. Force is analogous to, but not identical with, *drive* or *excitatory tendency* as used in S-R associationisms. (*Drive,* behavioristically defined, is a strong, persistent stimulus which demands an adjustive response.)

What Is Behavior?

In cognitive-field psychology *behavior,* when used, is defined quite differently from the way S-R associationists define it. The latter, in harmony with their interpretation of psychology as a study of the relationships of biological organisms and their physical and social environments, think of behavior as some kind and degree of measurable muscular or glandular movement. The movement may be only incipient or covert or it may be overt; nevertheless, its being behavior means that it is physical movement. Were adequate devices available, it supposedly could be observed and measured. Cognitive-field psychologists do not accept this definition of behavior.

In speaking of behavior, cognitive-field psychologists imply psychological locomotion but not necessarily any sort of physiological movement. One may "come closer" to another person, yet exhibit no physical evidence of locomotion. Behavior takes place in a life space, rather than in observable space. Psychological behavior is more or less conscious—verbal or symbolic—and may be equated with experience. Every specific instance of behavior must be viewed as the result of interaction of several pertinent features of a concrete situation. Broadly defined, then, behavior means any change in a life space which is subject to psychological laws. Thus behavior may be a change of the relative location of a person and his environment, a cognitive reorganization of his environment, or a restructuring of his person; it includes any change in valence of any part of his life space.

Psychological behavior and *locomotion* are analogous concepts. *Behavior* describes the simultaneous functions within a life space of an individual. *Locomotion* refers to the relative positions of respective regions of a person's *temporally continuous* life spaces. When we concentrate study upon a person and his current environmental situation, *behavior* adequately denotes changes which occur in a life space. However, when we consider a time element, a person appears to occupy a series of overlapping life spaces. The life spaces usually manifest a continuity; they are similar but not identical. Change in subsequent life spaces is locomotion. Consequently, depending upon whether we are centering our study upon the person-environment interactivity or the psychological continuity of a person's life spaces, we may represent any psychological phenomenon in terms of either behavior or locomotion; behavior centers upon how one sizes things up, locomotion on what one does about it as he moves into new life spaces.

BIBLIOGRAPHY

NOTE: References pertaining to Chapters 7 and 8 are at the end of Chapter 8. These two chapters should be studied as a unit.

CHAPTER 8

How does cognitive-field psychology deal with learning and teaching?

KURT LEWIN WAS interested primarily in a study of human motivation. Consequently, his field theory was not developed as a theory of learning, but as a theory of motivation and perception. However, he was concerned with the application of his theory to learning situations, and he did some writing in this vein. To develop a cognitive-field theory of learning, one must borrow heavily from the ideas and constructs of Lewin, but to some degree deviate from his psychology.

The cognitive-field psychology of learning has been formulated in an attempt to construct scientific principles of learning highly applicable to classroom situations. Its advocates rest its validity upon educational results, scientifically ascertained. They are convinced that, in light of the present stage of scientific development, this theory of learning is more likely than any other of which they are cognizant to lead to the most productive results in classroom procedures.

Whereas educational psychology of the past has emphasized overt behavior, cognitive-field psychology concerns itself with outward behavior only insofar as it may provide clues to what is transpiring psychologically—perceptually. "Psychological," in the sense it is used here, refers to personal involvement. Cognitive-field psychologists do not deny the validity, for certain purposes, of the study of the physiology of man (behavorial study), but they think that the two—physiological and psychological—types of study represent different scientific dimensions, each with its own uses. Since these psychologists consider the teaching function to be most closely associated with psychological or cognitive processes, they confine their emphasis to a study of how the cognitive structure of psychological fields is achieved or changed, that is, how insight is developed.

Cognitive-field theory involves the kind of generalizations about learning which may be applied to actual persons in school situations. It is associated with the knowing and understanding functions which give meaning to a situation. It is built around the purposes underlying behavior, the goals involved in behavior, and persons' means and processes of understanding themselves as they function in relation to their goals. Factors of a life space acquire meaning as a person formulates his goals and develops insights into ways of achieving them. Thus, this is a "goal-insight"[1] theory of learning.

Development of insight means getting the feel of a matter, grasping the idea, catching on to or seeing through a situation. An insight is acquired through doing something and seeing what happens. The focus of the learning is on the seeing, not, as has been assumed by S-R associationists, on the doing. Seeing, here, is broadly defined to mean catching the point or getting the idea. Any or all of the senses may be involved, and the sensory action may be pronounced or it may be so rudimentary that the person involved may not realize it is going on at all; he may think he is learning through the "mind's eye."

HOW MIGHT WE TEACH INSIGHTFULLY?

Within cognitive-field theory, learning, briefly defined, is a relativistic process within which a person develops new insights or cognitive structures or changes old ones. In no sense is it a mechanistic, associationistic process of connecting stimuli, which impinge upon, and responses, which are evoked or emitted from, a biological organism. Now, let us examine how we might teach a school subject insightfully. Our illustration is taken from the subject of arithmetic, specifically the teaching of the multiplication combinations involving the 9s. We use the 9s because these combinations generally are considered the most difficult. Furthermore, we use arithmetic because most teachers feel that, however one might teach other subjects, arithmetic must be taught by rote.

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[1] See Ernest E. Bayles, *Democratic Educational Theory,* Harper & Row, 1960, chap. 3.

This arithmetic lesson, as it develops, reflects the teacher's conviction that learning is an insightful process. The teacher is attempting to aid students in improving their understandings or insights in regard to multiplying by 9 and is doing it in such a way as to heighten their abilities to achieve new insights independently; he is not merely giving students a gimmick.

Let us assume that we are in a fourth-grade class and are ready to attack the 9s. We already have learned the 2s, 3s, 5s, 10s, and 11s, and we have learned them in such way as to have developed insight into the relationships involved in these tables. We can anticipate a kind of dialogue between students and teacher, which might go somewhat as follows:

The teacher reminds students of the tables they know already and has them review these tables until it is clear that they know them well. The review process might appear on the surface as drill in the old-fashioned sense, but there is a fundamental difference. The teacher makes certain that students understand the relationships involved, that is, relationships of the same general type as those they are about to learn in connection with the 9s. After the review, the teacher suggests that the class advance to the 9s. (Some students are likely to protest that the 9s are more difficult than any of the others.)

The teacher begins writing the tables on the blackboard, at the same time asking members of the class to supply answers which they already will have learned from their study of the other tables. A "side trip" may be necessary to help students grasp the insight that the product of 9 × 2 is the same as that of 2 × 9. What appears on the blackboard is something like this.

$9 \times 1 = 09$
$9 \times 2 = 18$
$9 \times 3 = 27$
$9 \times 4 =$

$9 \times 7 =$
$9 \times 8 =$
$9 \times 9 =$
$9 \times 10 = 90$

$9 \times 5 = 45$ $9 \times 11 = 99$
$9 \times 6 =$ $9 \times 12 =$

To this point, the answers supplied are based on students' prior learning of the 2s, 3s, 5s, 10s, and 11s. Let us now envisage the following dialogue:

TEACHER: How do we know the answers to 9×1, 9×2, and 9×3?
CLASS: Because we know the 1s, 2s, and 3s.
TEACHER: And what about 9×5, 9×10, and 9×11?
CLASS: We know these because we know the 5s, 10s, and 11s.
TEACHER: The ones that are left are the hard ones, aren't they? What is the answer to 9×7, Jimmie? Tell me without looking at the tables in your book. (Within instruction procedure, when the teacher addresses Jimmie or any other pupil, he anticipates that at least most members of the class are thinking along with the student spokesman.)

Jimmie probably will say nothing but will stare at the teacher, baffled. The teacher may then ask various other members of the class the answer to 9×6, 9×8, and 9×4. After the class begins to demonstrate a certain amount of bafflement (perhaps approaching the point of mild frustration), the teacher may entice them in this manner: "Would you like to gain enough understanding of the rest of the 9s so that after today you will know the answers to all of them?" The class is likely to respond in the affirmative with considerable enthusiasm.

TEACHER: All right, let's work at this thing together. June, go to the board and write the 10s up to 10×5 right beside the 9s. (The class now will have before it the following combinations.)

$10 \times 1 = 10$ $9 \times 1 = 09$
$10 \times 2 = 20$ $9 \times 2 = 18$
$10 \times 3 = 30$ $9 \times 3 = 27$
$10 \times 4 = 40$ $9 \times 4 =$
$10 \times 5 = 50$ $9 \times 5 = 45$

TEACHER: When we compare the 9s which we have answered to the 10s, what difference do we see in the answers? What happens in the case of the 9s which did not happen in the 10s?
CLASS: Each step we move up in the 9s, one is lost.
TEACHER: How do you mean?
CLASS: 9×1 is one fewer than 10×1, 9×2, is two fewer than 10×2, and 9×3 is three fewer than 10×3. That is why we get the answers 09, 18, and 27.

Of course, finding this principle may not come as easily as the foregoing dialogue might suggest. The teacher might need to do quite a lot more "fishing," by rephrasing the question and perhaps even offering some hints. The speed with which a class comes to see for itself principles which are new to it depends much upon what atmosphere has been established, and, of course, on the brightness of the students.

The teacher next helps students see that as in the 10s, the first digit goes up one each time, 09, 18, 27. By this time, the stage should be set for supplying the missing answers.

TEACHER: Now think carefully about what we have learned. Since $9 \times 2 = 18$ and $9 \times 3 = 27$, Gary, what is the answer to 9×4?

GARY: 36.

TEACHER: Why?

GARY: Well, if the first number increases by one for each larger table, and if we lose one in the last number of each table upward, it would have to be 36.

TEACHER: You already know the answer to 9×5. Judy, does it check with the idea which we have learned?

JUDY: Sure, the first number will be one larger, and we will have lost five numbers from the second number. That makes 45.

The reader should not be misled by the foregoing hypothetical dialogue. In order to economize on space, students have been pictured as saying the right thing the first time. In an actual classroom situation there would be more hesitancy, more fumbling, more tries on the part of students and teacher. But the process would remain essentially the same.

The class now is ready to deepen its insights in relation to the multiplication process.

TEACHER: Look again at the first digit of each answer. (Teacher points to the 9s through 9×5.) Look at each of these digits in relation to the multipliers, 1, 2, 3, 4, and 5. Do you see anything interesting?

GARY: Why, the first digit of the answer is always just one number smaller than the multiplier.

TEACHER: Why do you think this is so?

GARY: Would this be caused by losing a number each time—I mean, losing a number as compared with the 10s?

The teacher has succeeded in evoking the insight (at least in Gary) that when one multiplies by 9 rather than 10, there is a loss of one at each step, including the first. The answers "never catch up," so to speak. They keep falling behind, but according to a definite and predictable pattern.

Still another relationship may be taught the class:

TEACHER: Look carefully at the answers which we have so far. (The teachers points to 09, 18, 27, 36, and 45.) Add the two digits of each answer and see what happens.

CLASS: The sum of the digits is the same in each answer. The sum is always 9.

TEACHER: Yes. $0 + 9 = 9$; $1 + 8 = 9$; $2 + 7 = 9$. Why is this so?

CLASS: $9 \times 1 = 9$, then the first digit always increases by one, and the second digit decreases by one. They kind of balance each other, so the sum remains the same.

By this time the stage has been set for teaching the remaining combinations involving the 9s. When asked the answer to 9×7, students should reason that the first digit of the answer will be 6 $(7 - 1)$ and that the second digit should be 3 $(9 - 6)$. The class now should be able to complete the table through 9×10 easily. At 9×11, the first digit of the answer becomes two less than the multiplier. (Why?) Furthermore, the sum of the two digits of the answer does not equal 9, as it did in each preceding step. (Again, why?) Students will know the answer is 99. The problem is, why? Answer: $9 \times 10 = 90$; at 9×11 "we start around again"— $90 + 9 = 99$. At 9×11 the first digit of the answer has lost two from the multiplier: $11 - 2 = 9$, so in 9×12 the first part of the answer is $12 - 2$ or 10. For the sum of the digits to add to 9, the last digit is 8. Thus, $12 \times 9 = 108$. This can be extended into a game.

$$13 \times 9 = 117$$
$$14 \times 9 = 126$$
$$15 \times 9 = 135$$

The class members now are ready to test their new insights to see whether they will work. The teacher may suggest to his better students that they put into words the insights they have learned. However, it should be borne in mind that it is not always necessary for one to put an insight into words in order to use it.

In what specific ways does this lesson in arithmetic differ from traditional procedures used in teaching the multiplication tables? The answer to this question will express the significance of field psychology for learning and teaching.

WHY IS COGNITIVE-FIELD THEORY CONTRASTED WITH S-R ASSOCIATIONISMS?

Cognitive-field theory is so developed as to contrast rather sharply with the various associationistic or stimulus-response theories. Advocates of this theory do not deny existence of neural couplings but they do challenge the importance of the concept; they assert that it is inadequate to explain the learning process. Their position continues to be supported by research. In 1958 K. S. Lashley (1890–1958), who had devoted a lifetime to study of nervous function, stated: "I cannot pretend to have formulated a complete and satisfactory account of how the brain thinks. I recognize gaps and inconsistencies in my formulation of the problems, and the hypotheses that I have suggested will probably collapse under the weight of additional evidence."[2]

Lewin performed his early research with associative learning. He discovered that for terms or ideas to be associated—to have a connection formed between them—they had to belong to the same tension system. He found no force within mere association of items which leads to their reproduction; reproduction of acts or thoughts must be motivated. Thus, he contended that items are linked together in "memory" not through connections or associations but by the way they fit into the field organization or the task as a whole—by their configuration.

Since cognitive-field theorists are convinced that psychological activity depends upon energy related to psychological tension systems, to them no mere coupling principle can adequately explain psychic activity. They challenge forcefully the principle of adhesion, the attachment of one thing to another so that revival of the first brings forth the second. Consequently, they think that "reward" and "punishment" do not stamp in and stamp out associations. In contrast with S-R associationists, they emphasize changes in the valences—values—of parts of the psychological environment and in the tension systems of the person in relation to his environment.

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[2] Karl Spencer Lashley, Selected Papers of, *The Neuropsychology of Lashley*, edited by Frank A. Beach, Donald O. Hebb, Clifford T. Morgan, Henry W. Nissen, McGraw-Hill, 1960, pp. 541–542.

A psychological tension system exists in an individual's life space whenever a psychological need or intention appears. As a need or intention is fulfilled, tension is released. The strength of a need correlates with a psychological force. Such a force has one of two basic results. It leads either to psychological movement of the person in the direction of the force, or to a change of his cognitive structure corresponding to such a locomotion. This means that release of tension may be achieved either through reaching a goal or through restructuring one's life space, that is, through learning to "see things differently."

A high school girl has a driving ambition to become a movie star; thus in her life space there is a pressing tension between herself and stardom. Assuming that, like most girls, she does not have "the stuff" to become a movie star, tension must be relieved through some other course. She might reconstruct her life space so as to substitute a reachable goal for her earlier unattainable one. Or she might achieve a more drastic reconstruction and change her goals so that there is nothing left of stardom or any substitute. Such reconstruction of a life space is the essence of the learning process. Learning, so construed, is a change in the cognitive structure of, or insights in regard to, one's life space, which consists of a person and his environment.

HOW IS LEARNING A CHANGE IN INSIGHT OR IN COGNITIVE STRUCTURE?

Learning is a dynamic process whereby, through interactive experience, insights or cognitive structures of life spaces are changed so as to become more serviceable for future guidance. Insights may be verbal, preverbal, or nonverbal. One may gain an insight before one has words to express it, one may have a complete and exact verbalization involving no or little insight, or the insight and the verbalization may be achieved simultaneously. There is evidence that even nonverbal animals solve mazes by formulating a series of cognitive structures and testing them, and that they solve their problems through gaining insight into their situations.[3] By being given food, a dog is taught to "sit." Later he wants a toy which he sees on a table. He goes to the table, assumes his "sitting" position, and barks.

Insights derive from a person's best interpretations of what comes to him; they may be deeply discerning or they may not. They may serve as dependable guides for action or they may prove ruinous. Sultan, one of Köhler's apes, held a box in the air beneath a hanging banana. He then suddenly released his hold on the box and attempted to jump on it to reach the food. Sultan had an insight, but not a true one.

It is an insightful process when a ball player gets a feel for the correct swing of his bat, when a little child discovers how to dress himself, when a boy or girl learns to drive an automobile, when a child gets the idea of multiplication, perhaps through addition, or when a college student learns how to "read" Shakespeare.

It is in connection with goal-directed behavior that insightful learning occurs. One's direction or purposeful activity in his life space is dependent upon its cognitive structure. Remember that a life space contains a person (self) as well as his environment, and that through gaining and changing insights he cognitively structures both. A completely new situation would be cognitively unstructured; a person would have no knowledge of what would lead or point to what. Thus, at that moment his behavior would be completely random. (This is the position of an animal when it is first placed in a "problem box.") However, rarely, if ever, does a person function in a completely unstructured situation. More often we find students in situations which are inadequately or inharmoniously structured. This means that they have problems and need to extend their learning—change the cognitive structures of their life spaces.

A person's behavior in a relatively unstructured situation would appear exploratory, vacillating, and contradictory. An adolescent, for example, vacillates between a child's and an adult's world, neither of which to him is well structured. Newly acquired adult regions of his life space will not fit into a child's world, and some of the child's regions to which he clings will not fit in the adult world he is, at times, attempting to enter.

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[3] See Edward C. Tolman, "Cognitive Maps in Rats and Men," *Psychological Review,* July, 1948, pp. 189–208.

A child's behavior, to a very large degree, depends upon the cognitive structure of his life space. Learning results in building psychological traces which contribute to the structure and dynamics of future life spaces and thus affect future performance. Memory processes refer to cognitively structured similarities between an individual's life spaces which exist at different times. It is because of the continuity of life spaces and their cognitive structures that learning is of value to a person. Good insight into a present life space or situation tends to provide excellent foresight into the cognitive structure of future life spaces. Suppose a college student wishes to understand and appreciate principles of human development and learning and to prepare himself to apply them in future teaching situations. An excellent procedure would be for him to acquire a deep understanding of himself, his environment, and their relationships in his current series of life spaces.

Human beings, when behaving intelligently, are assumed to be purposive, and their learning is related to their purposiveness. According to cognitive-field psychology, a child in a learning situation is not unfolding according to nature; neither is he being passively conditioned always to respond in a desired manner. Rather, at his level of maturity and comprehension, he is differentiating and restructuring himself and his environment; he is gaining or changing insights.

Learning is a dynamic process; a constantly expanding world of understanding is reaching out to encompass a constantly expanding psychological world. At birth, a child's psychological world is very small. But on his level he is trying to understand that small world. He is trying to understand how to get food. Soon he will be seeking warmth. Later he will seek means of getting attention. As he grows, in order more adequately to influence his own destiny, he will seek insights into his world as it affects him. Hence, to one with a cognitive-field approach, learning means development of a sense of direction or bearing which can be used, when occasion offers and if found desirable, as a guide for conduct. This all means that learning is enhancement of intelligence.

WHAT KINDS OF CHANGES CONSTITUTE LEARNING?

Lewin considered learning to consist of four kinds of change, namely, *change in cognitive structure, change in motivation, change in group belongingness or ideology,* and *gain in voluntary control and dexterity of musculature.* He distinguished between the first two rather sharply. Thus, he tended to separate cognitive and motivational problems. To him, change in cognitive structure meant development of perceptual knowledge. It was centered in the topological—structural—aspects of a situation. Change in motivation, in contrast, meant learning to like or dislike certain areas—aspects—of a life space. However, he recognized that even changes in motivation arise from changes in cognitive structure; to change the valence of an activity for a child, one must change the cognitive structure of that child's life space in regard to it.

A child's change in motivation arises through his seeing regions or factors of his life space in a new light. To a 14-year-old boy, a girl, once "something to pull the hair of," comes to be a thing to be quite gently cuddled. A change in motivation is very closely related to changes in group identification. To a large degree it is the groups to which one belongs that are the source of his ideology and consequently of his motivation. One's person emerges through his becoming a member of a group, and it develops as he changes his group allegiances.

Growing into a culture through one's change in group belongingness and ideology and one's development of skills also involves primarily perceptions of oneself and the people and objects around him. Thus, these two types of change, too, are principally a process of change in the cognitive structure. Consequently, in treating learning, Lewin's pivotal concept was change in cognitive structure. In 1945 he wrote, "A change in action ideology, a real acceptance of a changed set of facts and values, a change in the perceived social world—all three are but different expressions of the same process."[4]

The cognitive structure of a life space corresponds to the meaningful knowledge of a person, knowledge being defined in the broadest sense possible. A change of cognitive structure may occur in any part of a person's life space, including the psychological past, present, or future. By defining all learning as essentially a process of developing cognitive structure or insights, we escape the dangers of forming a dichotomy—split—of knowledge and motivation. The formation of this dichotomy has led in the past to a rather sharp distinction between learning of facts and development of personality, character, and attitudes. Ideas involving emotional, motivational, and imaginative functions ultimately are as necessary in "factual" mathematical, scientific, and historical pursuits as they are in literature and the fine arts.

HOW MAY THE COGNITIVE STRUCTURES OF LIFE SPACES CHANGE?

Since all learning, essentially, is a matter of changes in cognitive structures of life spaces, we need an understanding of the various ways such changes may occur. Changes in cognitive structure include at least three types; namely, *differentiation, generalization,* and *restructurization* of regions of a life space. A *region* is a distinguishable, functional part of a life space; it is the psychological meaning of an object or activity. Regions refer, not to objective, physical areas, but to present or contemplated activities. The region in which a person is located delineates the qualities of his immediate surroundings, the kind of regions adjacent to other regions—possibilities for next steps—and what steps mean action toward or away from goals.

What Is Cognitive or Perceptual Differentiation?

Differentiation is the process in which regions are subdivided into smaller regions. In differentiation, relatively vague and unstructured regions of a life space become cognitively structured and more specific. Differentiation, then, means learning to discern more, and more specific, aspects of oneself and one's environment. What once were "kitties" come to be "leopards," "tigers," "lions," and "cats." What once was "toast" comes to be "bread," "crackers," "doughnuts," and "toast." What once was "baby" comes to be "doll," "me," "my arms," or "my legs," and later, "student," "member of club," "ball player," and "lady-killer." Differentiation proceeds at different rates at different times and, during crisis periods such as adolescence, its speed fluctuates rapidly.

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[4] Kurt Lewin, *Resolving Social Conflicts, op. cit.*, p. 64.

In differentiation of unstructured areas, previously vague and unstructured areas of a life space becomes cognitively structured and thus more specific. A person makes more sense of what, to him, was previously a "blooming, buzzing confusion." As a child grows he differentiates (1) himself—his person—from his environment, (2) different aspects of his person and environment from each other, (3) a past and future from the present, and (4) an irreality level from the reality level of his life space.

Since the meanings of the latter two kinds of differentiation—differentiation of time perspective and differentiation of reality from irreality—are so often misunderstood, we now explain them in some detail.

DIFFERENTIATION IN TIME PERSPECTIVE. During a person's development, an enlargement of his time perspective occurs; a psychological past and future become more significant. A small child lives very much in the present. His time perspective includes only an immediate past and an immediate future. As age increases, time perspective tends to expand. More and more, remote future and past events influence present behavior. These time-binding events occupy such a central part of many adult life spaces that it often is assumed that a past and a future actually exist in their own right. Careful thought, however, will bring the realization that the only past with which a person can deal is *what he thinks happened in the past.* Likewise, the only future which can influence a person *now* is his *anticipation* of a future which he thinks may, or is going to, eventuate.

A child's present life situation contains traces, or "memories," of past incidents and anticipations of future ones; but all of these are in his present situation or life space. The "past" can be of present significance only through operation of factors in the present which are identified as "past." That which persists from prior experience so that it is "past" in the present is *trace*.

When a second child has appeared in a family sometime in the past, the important factor, now, as far as the first child is concerned, is not whether his mother rejected him when the second child was born, but whether he interpreted the situation as one of rejection and carried the rejection into his present life space.

Anticipation of a future also occurs in the present; it is how one envisions the future—not what will actually happen then—that counts in the present. If a child is good in school on Monday so that he will get a star on Friday, whether or not he actually receives a star on Friday has nothing to do with his being good on Monday. His *anticipation* of the star is his motivation for his goodness on Monday. Recognition of the "presentness" of past and future in no way depreciates them; it places them in a psychological frame of reference—growth of time perspective is in terms of trace and anticipations which are functional parts of a present life space.

DIFFERENTIATION OF REALITY FROM IRREALITY. Irreality, as used in cognitive-field psychology, refers to wishing, dreaming, imagining, and kindred processes.[5] Normal development carries with it an increased differentiation in the reality-irreality dimension of one's life space. A young child does not distinguish clearly wishes from goals, hopes from expectations, or imaginative objects or events from facts; everything is real. To a young child nurtured upon concepts such as Santa Claus and Satan, these are among the most real things in the world. However, when a child realizes there is "really" no Santa Claus but continues to talk about him, he is differentiating irreality from reality. Although fantasy in the form of wishful thinking is very common in adults, they generally are better able to distinguish daydreams and wishes from reality than are children.

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[5] See Kurt Lewin, *Field Theory in Social Science,* Harper & Row, 1951, pp. 245–246. Reality-irreality refers to strata of a life space. Different degrees of irreality correspond to different degrees of fantasy; they include wishes and fears. Reality levels are characterized by relative rigidity, irreality levels of greater fluidity.

What Is Cognitive Generalization?

Although, in common usage, generalization is the opposite of differentiation, psychologically they are complementary. Generalization is the process whereby one groups a number of particular objects or functions under a single heading. Thus, one generalizes when he forms a concept which includes previously differentiated aspects of himself or his environment. Generalization arises through categorization of subregions into a unified region of one's life space. When a child learns that cats, dogs, horses, and birds are animals, or a student learns that his hopes, dreams, beliefs, and anticipations are all subregions of a "future" region in his contemporaneous life space, he is generalizing. A student of professional education, through differentiation of various instances of learning, may develop a generalized concept, learning, to cover any learning in any situation. A child, through differentiation and generalization, may divide the physical world into vegetable, animal, and mineral.

What Is Restructurization?

A person not only differentiates and generalizes his life space into new regions but simultaneously restructures his life space; he changes the meanings of respective regions in relationship to himself and to one another. Restructurization means that one defines or redefines directions in his life space; he learns what actions will lead to what results. He does this through perception of significant relationships of different functional regions of his life space. Consequently, restructurization consists of separating certain regions which have been connected and connecting certain regions which have been separated. (Remember that regions are defined as functionally distinguishable parts of a life space.)

When we were quite young, most of us differentiated people from their environments. Later we differentiated people into various races, classes, and groups. Perhaps about the same time we generalized them into Republicans and Democrats, or Christians and non-

Christians. As a person learns, he continues to differentiate and generalize himself and his environment, but he also restructures the differentiated and generalized regions of his life space so as to give them new meanings.

HOW IS INTELLIGENCE RELATED TO LEARNING?

Cognitive-field psychologists define intelligence as ability to respond in present situations on the basis of anticipation of future possible consequences and with a view to controlling the consequences which ensue. One's intelligence so defined consists of the number and quality of one's insights. Within this frame of reference, successful behavior rightfully may be called intelligent only when a person might have done otherwise and his actions were premised upon his envisioning what he was doing and why. Learning is enhancement of one's intelligence. This means that all of its forms—development of logical organization, social insight, appreciation, information, and skills—have a common element. They all involve a change in the experiential situation of a person which gives him a basis for greater predictability and control in relation to his behavior; they enhance his intelligence.

To a large degree, a person's intelligence is dependent upon the degree of cognitive structuralization—differentiation, generalization, and restructurization of his life space. As a child develops by means of these processes, he learns increasingly to understand and control his environment. However, teachers have no reason to fear

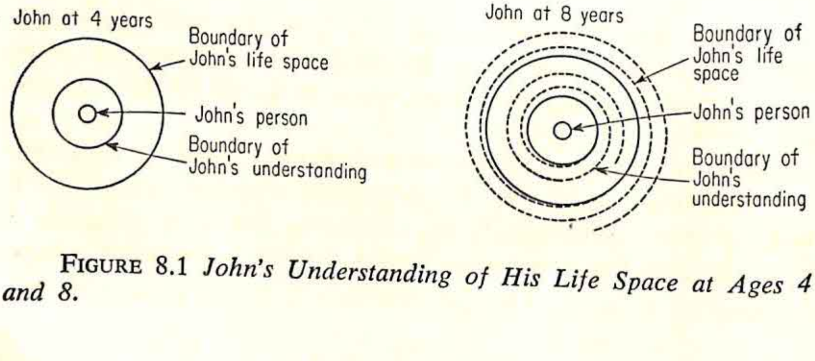
John at 4 years
Boundary of John's life space
John's person
Boundary of John's understanding
John at 8 years
Boundary of John's life space
John's person
Boundary of John's understanding

FIGURE 8.1 *John's Understanding of His Life Space at Ages 4 and 8.*

that a student will soon acquire complete understanding and will see no further need to learn. Once a student launches a serious study of his environment, his life space begins to expand. As his understanding expands to encompass his life space, so does his life space dilate to such a degree that his motivation for study actually multiplies. This is illustrated graphically in Figure 8.1.

How Does Intelligent Behavior Differ from Nonintelligent Behavior?

Cognitive-field psychologists view an intelligently behaving person as one who acts as if he is pursuing a purpose and has some foresight as to how it is to be achieved. Nonintelligent behavior arises when a person is pushed or pulled about as an inert, nonliving object, just as a stone dislodged from a place of support falls to a lower lodgement. Let us picture a man straddling a pole and attempting to raise it from among a pile of similar poles. He is behaving intelligently. As the poles are moved, their position changes and suddenly a group of poles falls on the far end of the pole he is lifting; another group in the center serves as a fulcrum and the poles raise him into the air. When he is raised into the air, he displays nonintelligent behavior. He is behaving—moving—but there is no connection between this specific movement and his foresight of consequences. In intelligent behavior, an activity is carried forward to a goal through a process by which one constantly searches out the conditions for the next step all along the way. Intelligence, then, is largely a matter of foresight.

What Is Habit?

Learning is habit formation, but under cognitive-field psychology, habit comes to have a special definition. Habit is not an act which is repeated automatically simply because of frequent repetition in the past. Neither is it a fixed sequence of acts which can be explained adequately as a system of preformed pathways in the nervous system. (Of course, some sort of concomitant neural action is not denied.) Habit is fluid, effective, efficient action arising through a person's operating on the basis of the insights he possesses. When one operates in terms of the insights or cognitive structure, he has, habit is manifested. Change in cognitive structure through differentiation, generalization, and restructurization means a change in meaning. When an event has meaning its psychological position and direction are determined; one knows what actions will lead to what results. This is the basis of habit.

Habits are goal-related—in fact, the essence of cognitive-field psychology is that all intelligent human endeavor is purposive. *A situation has meaning when it points to a course of action.* If a situation and its meaning are perceived simultaneously, then a person exhibits habit. Habit enables one to behave intelligently without thinking. Often there is not time to think; indeed, thinking then might be disastrous. What happens when your car is closely following a large truck going 70 miles per hour and the truck stops abruptly?

WHAT IS THE MEANING OF COGNITIVE-FIELD PSYCHOLOGY FOR TEACHING SITUATIONS?

To summarize a cognitive-field theory of learning, we may say that a person learns through differentiating, generalizing, and restructuring his person and his psychological environment in such way as to acquire new or changed insights or meanings, and thereby achieves changes in motivation, group belongingness, time perspective, and ideology; thus he gains in control of himself and his world. Now, how is this learning theory applicable to teaching theory and practice?

Within a cognitive-field approach to a school situation, each teacher and each student is considered a person-and-his-psychological-environment. A teacher's unique function is to implement the development of serviceable insights of students so as to help them become more adequate and harmonious personalities—that is, more intelligent. To accomplish this, a teacher needs a basic understanding of the structure and dynamics of life spaces.

Topology of a life space shows the various possibilities for psychological movement or action; *vectors* show the moving forces within the topological structure. To understand the behavior of a child, one must determine the psychological position of the child's person in reference to the goal regions of his life space. This entails knowing the child's social position within and outside various groups, his position in relation to various ideas and activities, and the role of physical objects in his life space. The relative region of a life space in which a child is located determines the qualities of his immediate surroundings. It sets the possibilities for the child's next step in his psychological life—his topology. It also determines his vectors—what step or event means action toward and what step means action away from his goals.

A student's life space on a given evening, topologically, may contain a TV set, a book, and a movie. Vectorially, each object and activity has some degree of valence—alluring or repelling power. Should he go to the movie, this means that movie valence is greatest of all. When one behaves intelligently, he does what he wants most to do; if he does not want to do it more than he wants not to do it, he does not do it.

For a teacher to analyze a psychological situation, he should describe the structure of a person and his environment and ascertain their dynamic properties—what they have to do with the student's behavior. That is, he must see the relationships between the regions or parts of the student's life space, and he must establish the nature of the respective factors residing within, at, and outside its boundary. Factors outside the boundary of a life space, the foreign hull, are those which may be perceived by others but at the moment have no place in the perceptual world of the person being studied. Knowing these facts helps a teacher determine what is possible and what is not, and what might happen and what might not. Then, to understand and accurately predict behavior, a teacher, in addition to understanding the structure of the student's field—the interpositional relationships between the parts in his life space—must also ascertain the dynamic properties of the person's life space—the valences of, and the barriers to, his goals.

Now what does all this mean in a school situation? Let us return to the schoolroom described on pages 199–201. "Alice is so absorbed with her teacher and school work that she is oblivious to everything else about her, including the other children." The teacher is central in Alice's life space. Alice's school work also is far within the border of her life space. The other children and everything else in the room that is not part of Alice's school work are in the foreign hull of her life space. "Helen is a social butterfly; she wants the attention of most of the children in the classroom. She does give attention to the teacher from time to time, but right now she is concerned with other things." The other children are in Helen's life space; the teacher is at the margin, sometimes in and sometimes out. "John's body is in the classroom, but 'psychologically' John is riding a shiny new tractor which is being operated in the field adjoining the school." John's school environment and his psychological environment have little in common. Whereas nothing within the room is in his life space, the tractor is as central as it can be and its valence is very high.

For a teacher to teach a student in a significant way, it is imperative that there be an intersection of the student's life space with the teacher's and with the other life spaces in the room. Life spaces intersect when they have regions in common. To insure an adequate intersection of life spaces, a teacher must probe the various regions of the life spaces of his students.

The way to peripheral regions of a person is quite accessible in ordinary conversation. However, it is more difficult to reach more central regions, that is, those needs near and dear to him. To gain an understanding of each student and his cognitive world, a teacher has to develop a sort of disciplined naïveté. In order adequately to see Tom through he must *see through Tom*. He must see Tom's person and environment as Tom sees it. When a teacher gains rapport with a student—when he gains his confidence—his influence can extend to the student's central regions and he is in a position to speak of the student's needs. What a person needs depends primarily upon how he sizes up himself and his material and social environment.

How Is Cognitive-Field Psychology Related to Democratic Education?

The cognitive-field approach harmonizes best with democratic educational situations which are committed to promotion of an intelligent, discerning citizenry. A democratic classroom, or school, should be a special environment for facilitating development of new and improved, widely generalizable insights by reflective means, and thereby should be conducive to growth of fertile, leaping, aggressive imaginations.

Advocates of cognitive-field psychology think that a teacher should teach, not baby-sit or dictate. A baby-sitter usually performs a custodial function but teaches children little, if anything. A dictator imposes the "right" answers. A teacher, in contrast with both, should perform his democratic teaching role in a process of student-teacher mutual inquiry.

The role of a teacher should be similar to that of a head scientist in a scientific laboratory; he should lead students in such manner that he helps them formulate and solve problems. To accomplish this, he should have a rich, extensive background of varied knowledge; he should be alert to the habitual attitudes and outlooks students are developing; and his ideal should be to promote an atmosphere which fosters maximum insightful growth. This means that he should be able to judge which attitudes or insights are conducive to continued growth and which are detrimental. He also should have sympathetic understanding of students as persons and should develop an accurate idea of what actually is going on in the life spaces of those whom he is teaching.

How Is Cognitive-Field Psychology Related to Reflective Teaching?

We may identify three levels of teaching which produce learning. Cognitive-field theorists think that *memory-level* teaching is least efficient. If memorized facts are remembered long enough (which is rarely the case), they may eventually be of assistance in the catching of insights. *Understanding-level* teaching is much more effective in the sense that it produces insights concerning the relationships between facts and facilitates the process of generalization and prediction. Understanding-level learning is impossible unless the facts taught can be put together into a meaningful—useful—generalization. *Reflection-level* teaching leads toward the catching of insights and the testing of generalizations—but also works toward the achievement of new solutions and ideas. It requires creative thinking and can occur only in a special problem-centered type of teaching-learning situation.[6]

Teaching for insight or understanding can be either reflective or nonreflective, but democratic teaching should always strive toward reflective procedures. Since a problematic situation is an unsettled or indefinite one, within the teaching-learning process a teacher should aim to keep students *perplexed just short of frustration;* this is the keystone of reflective teaching.

The products of reflective teaching and learning are tested generalizations or insights which have the character of *rules, principles,* or *laws.* A teacher may acquaint students with the teacher's insights, but they do not become insights for students until students see their meaning for themselves and adopt them as their own.

Reflective learning requires time and a series of life spaces or perhaps a life space of some duration. It includes finding, elaborating, and testing hypotheses. It arises in a situation where a person feels a need—has a goal. In place of a clear path to that goal he encounters a forked road or no road; the problem presents itself as an unclear, unstructured region. In thinking, there is a transformation or restructurization of the total field arising through perception of the total situation. We think our way into a system of living. Progress in thinking means that a person is fortunate enough to approach a solution by a new, more productive path. Through productive thinking he achieves effective changes in the cognitive structure of his life space—he gains new insights and he changes old ones. Within this process there is a place for practice, but not rote repetition.[7]

HOW MAY COGNITIVE-FIELD PSYCHOLOGY PROVIDE AN EMERGENT TEACHING THEORY AND PRACTICE?

When we critically evaluate psychological theories from the point of view of their applicability to classroom practices, we see that whereas certain aspects of respective theories of learning and teaching support or supplement one another, some others openly conflict or disagree. Furthermore, when we study the major outlooks in regard to learning and teaching which have arisen in Western civilization and are still with us, it becomes quite evident that actual educational procedures often reflect inconsistent hodgepodges of bits of several systematic theories developed from time to time. Thus, educators often are not able to provide effective educational leadership because they themselves are not certain of where they think they are headed.

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[6] The three levels of learning are discussed in some detail in Chapter 11, pages 315–325.

[7] See pages 296–297 for a discussion of the difference between practice and repetition.

An educator has at least three possible choices of action. In teaching, he may conform rigidly to one systematic theory of teaching and learning—mental discipline, natural unfoldment, apperception, S-R associationism, or Gestalt-field theory; he may eclectically—selectively—borrow freely from the various outlooks and arrange his ideas into a mosaic or patchwork which is available for him to draw upon as need arises; or he may develop an *emergent synthesis*—a genuinely new outlook which benefits from knowledge of all previously developed psychological theories but is not an eclectic compromise between them.

An *emergent* is something novel which appears in the course of evolution of ideas. When an emergent outlook reflects the results of the interplay of conflicting ideas and arrives at something new, it is a *synthesis*. Whereas one forms an eclectic compromise by selecting aspects of opposing theories and taking a position somewhere in between them, one achieves an emergent synthesis by selecting and modifying knowledge from incompatible positions, adding new thinking as needed, and developing a new position which is internally consistent.

Adherents of a relativistic cognitive-field psychology think that this approach may come to function as an "emergent synthesis" capable of transcending the difficulties underlying other positions and at the same time providing a psychological base for a set of school practices which will reflect a knowledge of pertinent scientific evidence and will be both adequate and internally consistent. The first step in development of such an emergent synthesis is an evaluation of other existing major learning theories.

How Defensible Are the Premises of Mental Disciplinarians?

People who make moralistic judgments about the nature of human nature encounter great difficulty in attempting to prove, or disprove, their theses scientifically. However, whether a person's study of a "mind training" subject such as geometry strengthens his thinking faculty is susceptible of scientific test. And attempts to support mental disciplinary propositions experimentally appear to have been unsuccessful. Within a prescientific frame of reference of faculty psychology or classicism, mental discipline seems quite harmonious; however, we may question its adequacy for schools in a modern scientific age. (An outlook or thought pattern which is scientifically most satisfactory is one which is both *adequate*—consistent with known facts or pertinent data—and *harmonious* in the light of all obtainable pertinent data.)

What Are Strengths and Weaknesses of Apperception?

Apperceptionists recognized that a student acquires new learnings in relation to what he already knows, but they failed to define the learning process in other than mechanistic terms. Thus, in considering a child a passive mind, they opened the way for S-R associationists' treating him as a passive mass of protoplasm. They recognized a principle of activity, but they attributed the activity to ideas, not persons. Consequently, apperception has implied a policy of student indoctrination; the teacher, a specialist in mental chemistry, fills the apperceptive masses of his students with *proper* ideas. Apperception indeed is internally harmonious, but we can question its adequacy, particularly for schools in a democratic society.

How Adequate Is Neobehaviorism?

Thorndike's psychology, and that of later behaviorists and neobehaviorists, likewise is internally harmonious but, to cognitive-field theorists, it lacks adequacy. Connectionistic and behavioristic psychologies are "scientific" in the sense that, in the main, propositions which emerge from them are susceptible of scientific test. Results of an education based upon them likewise can be rather objectively measured. However, criticisms of connectionistic and behavioristic psychologies, when they are used as guides in teaching, lie in the supposedly poor results which follow. This does not mean that, when teaching takes the form of more or less mechanical drill, students do not learn anything. The amount they learn seems to depend largely on how highly motivated they are; students do not necessarily learn in the way teachers think they are teaching them.

Traditional education generally represents an amalgamation of mental discipline, apperception, and S-R associationism along with a few influences of Gestalt-field psychology. Aspects of the first three positions sometimes blend and sometimes clash. However, in that all three imply a teacher-centered, autocratic procedure in teaching, they are much alike.

Is Permissivism the Answer?

Can anything better be said of the ultra permissivism which has been advocated by one group of educational progressives which has seen development and learning as basically a process of natural unfoldment? Are the educational results of this approach demonstrably superior to those of traditionalism? Claimed fruits of permissive unfoldment are changes in attitudes and values such as are required for democratic living, inclination toward self-expression, and creative thought. Results of this kind are not unmeasurable, but they are much more difficult to measure than are memorized facts. Traditionalists can at least measure their results in terms of highly specific knowledge and skills.

A teacher who favors a large degree of permissivism may do so simply out of a feeling of sentimentality toward children. In this case, being able to watch children enjoy themselves in an uninhibited way may be reward enough in itself to the teacher. However, this does not answer the question of whether children experiencing a permissive type of teaching are actually learning that which will enrich their lives most or make them the best possible citizens and workmen.

How Does Cognitive-Field Psychology Supposedly Eliminate Weaknesses of Both Traditionalism and Permissivism?

Although not without some distinctive weaknesses of its own, teaching based on cognitive-field psychology appears to be an emergent position which, if widely adopted in our schools, might eliminate some of the inadequacies of an earlier period. The approach to teaching implied by this psychology, although in many respects distinctively different from other approaches, should at the same time have some appeal for traditionalists and progressives alike.

In contrast to behaviorists, cognitive-field psychologists are interested mainly in reflective learning and the ways in which its quality can be improved. Consequently, an educational program consistent with a cognitive-field psychology focuses on teaching students to think more effectively in a wide variety of situations; it entails problem-centered teaching.

A large group of liberal arts scholars in the present world, too, wants to teach students to think more effectively. Most of these persons, however, are inheritors of the classical tradition in education, and to the extent that they think in psychological terms they still cling to a mental discipline psychology. But if they were to make a careful study of systematic psychologies, in relation to contrasting educational philosophies, it seems likely that the only modern school of thought in psychology which they could accept would be a cognitive-field psychology. Cognitive-field is the contemporary scientific psychology which perhaps harmonizes best with the professed aim of scholars in the arts and sciences of giving education an intellectual emphasis. Joseph Wood Krutch, a prominent liberal arts scholar, literary critic, and author, has written a book pleading for rejection of mechanistic psychologies (such as connectionism and behaviorism) and for adoption of a nonmechanistic psychology whose main interest would be study of reflective and creative mental processes.[8] Widespread acceptance of cognitive-field psychology possibly would restore an intellectual emphasis in education and at the same time provide a psychological

[8] Joseph Wood Krutch, *The Measure of Man,* Bobbs-Merrill, 1954.

basis for education free of the criticisms validly made of the old "mind training" approach.

Cognitive-field psychologists certainly do not object to having students learn facts and remember them for future use. However, their emphasis is upon the students' growing to see the world and themselves differently, and facts are acquired and used in the process. They emphasize that facts are best learned when they are regarded by the learner as instruments for serving purposes which he feels are important—when they are connected with problem solving. True, a background of factual information or skills is regarded as useless, unless it has sufficient pertinence to the common problems of life to furnish hypotheses and data for solving them. But a growing number of teachers, including those educated in the behaviorist tradition, would accept the legitimacy of these claims; most everyone wants students to be able to use what they learn.

Adoption of cognitive-field psychology as a basis for teaching would lead to greater student participation than is permitted by traditional teachers, but participation of a different kind from that advocated by Roussellians. In contrast with either authoritarian or laissez-faire classrooms, the ideal classroom, consistent with cognitive-field psychology, would be democratic. Although cognitive-field psychology is not a compromise between the psychologies underlying traditionalism and permissivism, it does lead to a kind of middle position: a position which permits students a considerable amount of freedom but only within certain confines; it implements an ideal, precise balance between authority and freedom.

It is possible that cognitive-field psychology may come to command the support of both those who have thought that teachers should be centers of authority and those who have felt that classrooms should be child-centered. Both traditionalism and permissivism are extreme positions which have been widely attacked. The former is criticized on the ground that it does not permit children enough freedom for intellectual exploration, and the latter on the ground that it assumes that adequately worthwhile learning will necessarily result if children are given free rein and allowed to plan their own activities. So far as the relationship between teacher and students is concerned, cognitive-field psychology offers a more moderate course than either traditionalism or permissivism. A common, constant purpose of cognitive-field psychology is enhancement of intelligence as teachers aid students in changing or reconstructing the cognitive structures of their life spaces. In accomplishment of this purpose there is not *teacher* or *student,* but *teacher-student,* purposing, planning, fulfillment, and evaluation of the learning tasks at hand.

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CHAPTER 9

How does learning transfer to new situations?

A PREDOMINANT PURPOSE OF formal education in schools is to facilitate learning outside them. It would be difficult to justify any achievement of school learning which had no bearing upon students' future learning in life situations. Nevertheless, often what is learned in school contributes very little, if anything, to children's and youths' solving their future problems. Thus, there appears to be much room for improvement in our teaching procedures so that transfer of school learning to other situations will be enhanced to a much greater degree than at present.

Transfer of learning occurs when a person's learning in one situation influences his learning and performance in other situations. If there were no transfer at all, students would need to be taught specifically every act that they ever were to perform in any situation. Although, when we think of transfer, we usually consider how one learning experience strengthens another, we should remember that there also is a negative transfer process within which one learning experience interferes with—weakens—another. However, generally speaking, what we learn in one situation tends to facilitate or help our learning in others. But the opposite effect, interference, can occur. For example, a person's study of foreign language or philosophy can make him a slower reader of English literature, or his becoming committed to certain dogmas or absolutes can interfere with his future creative, reflective thought.

In its broadest sense, *transfer of learning is basic to the whole* *notion of schooling*. People who support, as well as those who conduct, our schools assume that matters being taught today will have some learning value in later times in different situations. Thus, the assumption which underlies our entire public education system is that learnings gained in school not only will be available in the future but also will be applied in some degree to the solution of new problems as they arise in oncoming school and life situations. For instance, we assume that today's lesson in arithmetic will help with tomorrow's problems in the same subject and that it also will help in dealing with algebra, geometry, and the physical sciences.

The effectiveness of a school depends, in a large measure, upon the amount and quality of transfer potential of the matters that students learn. Thus, transfer of learning is a cornerstone upon which education should ultimately rest. Unless students learn in school those matters which help them in meeting situations more effectively further along the academic sequence and later in life, they essentially are wasting their time.

We suggest that you reflect briefly upon the learning which you achieved while you were in high school. You studied, and apparently mastered, a number of different courses. These courses contained factual detail, generalizations, and techniques. Periodically, you showed on an examination that you had learned fairly well the content of each course. How much of your high school learning do you now retain in such a way as to be able to use it in contemporary situations? What dealing did the United States have with Napoleon? How does a participle differ from a gerund? If the school house is 1½ miles north and 2 miles east of a boy's home, what is the shortest distance from his home to school? What is the basic difference between the structure of San Francisco Bay and the Strait of Georgia?

If you do not do too well with questions such as these, you need not be completely chagrined. Studies such as the Regents' Inquiry of the State of New York found such inability to be typical among students. As many as 20,000 students in New York State and elsewhere were given a variety of tests in an effort to assess the total impact of their school experience. Perhaps the most significant report to emerge from this massive piece of research was a discussion of the effectiveness of the social studies in producing better citizens.[1]

The Regents' Inquiry revealed, among other things, a very high rate of forgetting. Students, who took a course in United States history or civics in the eighth grade, forgot most of the subject content by the time they entered the eleventh, when they commonly repeat the subject. Students possessed very little accurate information, but a considerable amount of misinformation, about current affairs. They also revealed appalling ignorance about their home communities. Furthermore, they performed very badly on tests of map and chart reading, and their finding sources of information.

A change of attitude usually is considered a more important outcome of education than the *mere* acquisition of information, and the Regents' Inquiry did reveal that, during four years of high school, students moved somewhat in the direction of what might be termed a "liberal, democratic outlook." However, most of the students tested indicated that they were unwilling to make any kind of personal sacrifice to promote democratic aims and group welfare.

HOW IS TRANSFER A PROBLEM?

The basic problem of transfer is: In what way and to what extent will acquirement of skills, knowledge, understanding, and attitudes in one subject or type of situation influence the same in other subjects or situations? Knowing the answer to this and some subordinate problems will enable us to teach for maximum, effective transfer of learning.

Some subordinate transfer problems are: (1) how does a person's current learning assist in meeting future learning situations? (2) how does what youngsters learn in school affect what they learn and what they do outside school? and (3) does school learning have as much effect as it should and how can it be made more effectual?

More specifically, in what manner and how much does the learning of a given material, say, memorizing the names of all the states and their capitals, aid, hinder, or have no effect upon subsequent learning, say learning the content of a textbook? To what extent and in what way does the study of Latin enhance English vocabulary and grammar, aid in learning French or German, or contribute to knowledge of ancient history? How does a study of theories of learning contribute to one's knowledge of how to teach fourth grade reading or high school physics? Will an individual carry over the arithmetic ability he learned in a classroom to the problems he actually encounters in business or in tasks about the house? Does practice in memorizing, reasoning, persevering, and willing improve the mental process in general? Can one improve his perception, retention, and imagination in all fields by practice in one?

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[1] See Howard E. Wilson, *Education for Citizenship*, McGraw-Hill, 1938.

The critical question in regard to transfer is not whether it takes place, but what conditions engender the greatest amount of it. Classroom teaching definitely can be conducted in such way as to achieve transfer. Furthermore, it is highly probable that teaching can be made to achieve a much higher degree of transfer than it now does. However, in order that we may teach for maximum transfer, we need to decide how transfer takes place. Having done this, we need to help students learn how to learn in such a way that transfer will reach a maximum level.

Everyone seems to agree that we want maximum transfer of learning to new situations. But, when laymen and teachers discuss what and how the schools should teach, there is strong disagreement about the nature and likelihood of transfer. At one extreme, classical scholars advocate a strictly intellectual curriculum consisting of science, mathematics, classical languages, and history. At the other extreme, some educators maintain that learning which remains completely verbal or abstract has negligible effect on learning and acting in concrete life situations. The latter group thinks of learning and transfer as being highly specific. Thus, its members believe that we should prepare students step by step for personal, civic, and vocational adulthood.[2]

Although teaching for transfer is of prime importance, it can be overemphasized to the degree that it actually impedes learning. Consequently, though we should enthusiastically promote transfer of learning, we simultaneously should recognize the possible negative consequences of an overemphasis which may contribute to a "cold storage" concept of education. We might come to think that childhood is not worthwhile in itself and that we must always be preparing for adulthood. Thinking such as this can have disastrous consequences; "preparation," if overworked, can have a vicious connotation.

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[2] See Percival M. Symonds, "What Education Has To Learn From Psychology, VII Transfer and Formal Discipline," *Teachers College Record,* October, 1959, pp. 30–45.

Then again, we should guard against defining transfer too narrowly. Although it was a tremendous jump, it was an example of transfer of learning when Newton shifted the concept of falling bodies from small objects to planets. Furthermore, when we say that our central aim in education is to increase students' abilities to think, we are discussing transfer.

WHAT QUESTIONS ARE BASIC TO A STUDY OF TRANSFER?

Each systematic theory of learning—mental discipline, natural unfoldment, apperception, S-R bond, conditioning, reinforcement, goal insight, and cognitive-field—implies a somewhat different theory of transfer. In fact, a description of the theory of transfer of a given learning theory has much in common with a description of the learning theory itself.

Adherents of each learning theory develop their position in regard to transfer through answering some specific questions, such as: (1) How is learning best defined? (2) What is the meaning and significance of intelligence or individual differences in learning ability? (3) What exactly does transfer of learning mean? (4) How is transfer promoted most effectively? In the remaining sections of the chapter we review the various answers which adherents of different theories provide for these questions.

Although questions 1 and 2 on learning and intelligence are not centered on transfer as such, we must first review them in order to establish a background for consideration of the transfer problem proper, which is represented by questions 3 and 4 on transfer of learning and its promotion. The transfer problem is so pervasive that any treatment of the position of adherents of a systematic learning theory in regard to transfer, of necessity, comprises a summary of the learning theory itself.

In our examination of the various outlooks in regard to transfer of learning, we concentrate in turn upon natural unfoldment, mental discipline, apperception, S-R bond theory or connectionism, operant conditioning, generalizations, and Gestalt-field approaches. Six of these also are names for theories of learning. Only generalizations is uniquely a theory of transfer. As such, it is an aspect of several learning theories. The generalizations theory of transfer emerged as a protest against the atomistic specificity of earlier S-R associationistic psychologies. It may be considered a connecting link, although sometimes a confusing one, between the S-R associationistic transfer theories and the insight transfer theories of the Gestalt-field family.

Since, by its very nature, natural unfoldment has few, if any, positive implications for transfer, we deal with it here only briefly. Exponents of natural unfoldment regard the development of intelligence as something which "just naturally happens." To be consistent with their overall outlook, they would reject any kind of formal teaching for the purpose of stimulating development of intelligence. Instead, they would stress student-planned activities including highly permissive types of projects as the means for releasing or developing latent intellectual performance. In a laissez-faire classroom students would exercise unlimited freedom (see page 31).

Since Professor Skinner is highly optimistic in regard to the application of his theory to practical schoolroom situations, we use his ideas on transfer as a contemporary representative of the S-R associationistic family. Each of the representatives of this, as well as the other psychological outlooks, has his own theory of transfer; however, there tends to be a similarity between the theories of transfer of the various members of each family of learning theory.

Because of the great similarity in the theories of transfer of various members of the Gestalt-field family, we present a unified treatment of transfer as representative of this group. There is little difference among the transfer theories of Gestalt psychology, Bayles' goal insight theory, and cognitive-field psychology. Consequently, a composite position is developed for this family.

HOW DOES MENTAL DISCIPLINE IMPLY GENERAL TRANSFER?

The conception of education as mental discipline seems to go far back in recorded history. Furthermore, prior to the nineteenth century, general transfer of training through mental discipline was widely accepted in educational circles of the western world.[3] Consequently, from its earliest beginning until the end of the nineteenth century, American formal education was dominated by the doctrine of mental discipline. During this period education was regarded as necessarily unpleasant. The schoolroom atmosphere was at least austere and sometimes harsh. Teachers usually were dictators, sometimes benevolent, but sometimes even spiteful. Children were expected to be respectful and obedient and to accept at face value whatever teachers told them. Curriculums were relatively fixed with an almost exclusive emphasis in elementary schools on the fundamental skill subjects, and in secondary schools on such "disciplinary" subjects as Latin, history, and mathematics.

In 1865, James B. Wickersham, State Superintendent of Public Instruction of Pennsylvania, wrote as follows in a book entitled *Methods of Instruction:* "The intellectual faculties can receive culture only by judicious exercise. . . . No means are known whereby the faculties of the mind can be developed but by exercising them. By the potent spell of the magic word Exercise, is evoked all human power."[4] Here we see an able scholar even as late as the middle of the nineteenth century definitely committing himself to a doctrine of mental discipline and more specifically faculty psychology.

The two most influential groups in the United States who continue to favor a disciplinary approach to education are some church officials, particularly those dedicated to parochial education, and those liberal arts professors who are under the influence of faculty psychology and the classical tradition. In addition to these there are many thousands of other persons, including some public school teachers, who gravitate toward a theory of mental discipline.

[3] See Chapter 2, pages 19–31, for a more detailed treatment of mental discipline.

[4] Taken from Ernest E. Bayles, *The Theory and Practice of Teaching*, Harper & Row, 1950, p. 87.

How Do Mental Disciplinarians Define Learning?

The central idea in mental discipline is that the mind—envisioned as a substance—or its faculties lie dormant until they are exercised. Faculties such as memory, will, reason, and perseverance are the "muscles of the mind"; like physiological muscles, they are strengthened through exercise and subsequently operate automatically. Thus, learning is a matter of strengthening, or disciplining, the faculties of the mind which combine to produce intelligent behavior.

Adherents of mental discipline think that the main value of history or any other disciplinary subject is the training effect it has on the minds of students. They are convinced that this effect will remain after the material has been forgotten. Furthermore, they consider the highest value of education to be its liberalizing effect. Education that is truly liberalizing, supposedly, prepares us not only to live in the world, but more important, to live with ourselves. In 1959 James D. Koerner, a contemporary exponent of mental discipline, wrote, ". . . *the purpose of* [*liberalizing*] *education is the harmonious development of the mind, the will, and the conscience of each individual so that he may use to the full his intrinsic powers and shoulder the responsibilities of citizenship.*"[5]

How Do Mental Disciplinarians Define Intelligence?

Prior to the 1600s it was thought that little, if anything, could be done to improve the intelligence of an average man. Until the coming of the "age of enlightenment" of the seventeenth and eighteenth centuries, it was generally assumed that attempts to improve the quality of the intellect of an ordinary person were doomed to defeat. This pessimistic and fatalistic view of the human race dated from ancient man and paralleled the doctrine of mental discipline.

Although mental disciplinarians often fail to define their terms carefully, it is evident that their view of the meaning of intelligence is different from that of persons who reject this approach to learning. To mental disciplinarians, intelligence is a condition characterized by relatively high development of the faculty of reason. Since, according to the doctrine of mental discipline, the chief purpose of education is to strengthen the mental faculties, especially will and reason, through appropriate kinds of drill, an intelligent man is a highly rational one. The faculty of reason, when well exercised and developed, supposedly qualifies its owner to reason intelligently—accurately and logically—in regard to any matter.

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[5] James D. Koerner, Ed., *The Case for Basic Education*, Little, Brown, 1959, p. v.

How Do Mental Disciplinarians Define Transfer?

According to mental discipline, germs of the various faculties supposedly are in each individual from birth, and learning is a process of developing these germinal, undeveloped faculties into powers or capacities. When a teacher is asked concerning the value of studying his particular subject and replies, "It sharpens the mind and improves the memory, or it cultivates the reasoning faculty," he is thinking of learning as mental discipline and of that which is transferred as being a generally exercised germinal capacity. He feels that he is building in his students a great power reservoir that automatically goes into operation in any kind of subsequent mental activity.

The various faculties supposedly can be developed through training and become capable of effective performance in all areas in which they are involved. Thus, the training of the faculty of memory through memorizing nonsense syllables presumably improves one's memory for names, meaningful material, and in fact for anything which calls for memory. Likewise, it is assumed that after training in reasoning through a study of geometry, a person can reason effectively in realms of philosophy, mathematics, social issues, and housekeeping. Accordingly, education largely is a matter of training or disciplining minds with vigorous mental exercise in the classics, grammar, logic, mathematics, and science on the assumption that such training makes a person equally effective in all areas where a given faculty is employed.

Since, in mental discipline theory, transfer is assumed to be automatic, once a faculty has been developed it supposedly goes into operation whenever its use is appropriate. Notice that, within mental discipline, the processes such as thinking, attending, remembering, and persevering became substantialized—made real—into thought, attention, memory, and perseverance.

How Do Mental Disciplinarians Promote Transfer?

Educational practice based on the theory of mental discipline stresses the necessity for developing the "sinews of the mind" by rigorous exercise. Mental disciplinarians have little desire to make school work pleasant or interesting; in fact, more discipline is engendered if the tasks are unpleasant and burdensome; the harder the exercise, the more the faculties are disciplined. Thus, the more difficult the school work, the more effective it is thought to be. Since subjects such as Latin, mathematics, and science taught mechanically seem particularly arduous, these subjects have been enthusiastically taught in the schools for their disciplinary value.

To a mental disciplinarian the direct utility of a subject is of little consequence; exercise of the mental faculties is what is important. The material or content upon which the exercise is expended makes little difference, except that it must be of such nature as to require strenuous exertion. Certain mental powers or faculties such as tenacity and logicality, exercised and developed in the study of, say, botany, supposedly carry over automatically to all aspects of life wherein the same mental powers are required.

Since mental disciplinarians are not interesed in life adjustment education, they work to stretch, not relax, the minds of their students. They are convinced that a teacher should be not an amateur psychiatrist, social worker, and baby sitter, but a scholarly educator. Since faculties supposedly are strengthened through mental practice much as muscles are strengthened through physical exercise, the most difficult subjects are the most desirable for stretching the mind. Furthermore, long, difficult assignments supposedly develop the faculties of will power and attention.

Mental discipline as an educational doctrine was first seriously challenged by William James, who found no improvement in his ability to commit poetry to memory resulting from a month's practice in memorizing Hugo's *Satyr*. Thorndike and Woodworth[6] reported similar findings in regard to possible development of mental faculties through exercise. However, even in the face of James', Thorndike's, and Woodworth's research in this area, many scholars continue to endow certain subjects, particularly the more abstract ones, with immensely superior transfer power.

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[6] See Chapter 2, pages 29–31.

Students who have mastered difficult subjects usually do have above average proficiency in whatever areas of study and thinking they happen to pursue. Although it doesn't necessarily follow, it is easy to assign credit for this proficiency to the specific subjects which have been studied; it often is overlooked that people who elect or survive difficult subjects perhaps had more ability when they started them. This is an example of the *post hoc ergo propter hoc*—after this, therefore on account of it—fallacy; instructors and others fallaciously reason that after taking certain courses youth are good students, therefore the courses made them into good students.[7] We should recognize, however, that, even though mental disciplinarians' reasoning may be fallacious in this regard, their procedure becomes a screening device, whether or not it is an educating one. A school may "maintain high standards" through teaching for mental discipline and grading so rigorously that a high percentage of students fail and drop out. By so doing, it can raise the quality of its students; but the increased quality of students, so gained, is no indication of improved quality of instruction.

Today the concept of mental discipline is unpopular with most psychologists and professional educators. Experimental evidence indicates that memory as a general function is not improved by strenuous memorization of poetry. Likewise, reasoning in fields other than mathematics is not automatically improved by studying algebra and geometry. However, there are still scholars, parents, and other school patrons who are convinced that Latin, science, and mathematics should be included in the school curriculum because they are "good for the students' minds."

The theory of mental discipline has been discredited to the point that it is difficult to justify school subjects purely in terms of improving students' minds through exercise. Evidently there is transfer of learning, but not the general transfer implied in mental discipline. Methods of solving arithmetic problems can be transferred to the solution of problems in algebra. The learning of Latin may, and often does, facilitate the learning of English grammar. However, if experimental research is to be trusted, transfer is not automatic, and it is not a matter of disciplining minds.

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[7] See Chapter 2, page 30.

Herbartian apperception, S-R associationisms, and Gestalt-field theories of learning, while disagreeing on many points, all agree in their opposition to mental discipline. Their strongest weapon has been systematic research which tests the results of different teaching and learning procedures. During the first half of the twentieth century, it seemed that Thorndike, Woodworth, and James had rendered a killing blow to mental discipline, and that it no longer would be seriously promulgated in our public schools. However, during the 1950s and 1960s, many scholars in the arts and sciences and others following in their wake have seriously and vehemently advocated this theory of learning and transfer, divorced from experimental evidence and support.

As we study outlooks on transfer which have arisen to challenge mental discipline, perhaps we can crystallize on a point of view which is more adequate than mental discipline itself or any of the competing theories which immediately followed and challenged it.

HOW IS APPERCEPTION RELATED TO TRANSFER?

There are two broad types of associationisms: (1) early mentalistic associationisms which focused upon the association of ideas in a mind, and (2) more modern physicalistic S-R associationisms which concern themselves with formation of connections between cells in a brain and peripheral nervous system or between organic responses and environmental stimuli.

Herbartian apperception has been the leading example of the first type of associationism. Although Herbart's associationist psychology was built on fundamentally different premises from the natural unfoldment theory of followers of Rousseau, it was equally incompatible with mental discipline. Hence, Herbartian teaching, like Rousselian permissiveness, can be considered a counterinfluence to mental discipline. The formal, rigid approach of Herbartians, however, coupled with what seemed to be emphasis upon rote learning, made their teaching appear on the surface to be much like the kind of education practiced by the mental disciplinarians.

Herbart's prescription for good teaching, as implemented by his followers, became highly mechanical. Both apperception and mental discipline make a teacher equally central and dominant in the educational process. The Herbartian five steps—preparation, presentation, comparison, generalization, and application—seemed to put teaching on a different plane from that of mere drill and rote memorization. Nevertheless, Herbartian teachers are like the other associationists in one respect: the teacher is the dominant figure and students are permitted little opportunity for creative reflection.[8]

How Do Apperceptionists Define Learning?

Apperception is a process of relating new ideas or mental states to a store of old ones. Memories stored in the subconscious and brought into the conscious enable one to interpret experience of the moment. New ideas are learned through their being related to what already is in an apperceptive mass. Thus, apperception consists of becoming consciously aware of an idea and assimilating it with other, already acquired ideas. A student's mentality is made up of the world of ideas which is presented to him from without.

Learning, then, is not a matter of developing or training a mind, but rather one of formation of an apperceptive mass. Education is a process of teachers' causing present, specified experiences of students to combine with appropriate backgrounds. Consequently, apperceptionists emphasize implantation in the minds of students of a great mass of facts and ideas which have been organized by someone other than the learner—usually the author of a text or a teacher.

How Do Apperceptionists Define Intelligence?

Psychologists in the tradition of apperception had a characteristic manner of defining intelligence as an acquired ability. Remember that they regarded learning as a process of storing away ideas.

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[8] See Chapter 2, pages 36–47, for a detailed treatment of apperception.

Hence, they equated intelligence with capacity to associate and retain ideas and call them forth when needed in proper association with one another. To them a mind acts somewhat the way a boy managing his marbles does; except for those in use, he keeps them put away, but they are stored in a sufficiently organized manner so that the boy can easily get his hands on his favorite "shooters," as well as his cheap, expendable glass marbles, when he needs them. *Intelligence* refers to a person's acquired general effectiveness at storing "mental marbles" in an organized fashion and selecting efficiently those which are appropriate as the need arises. The active nature of intelligence, however, resides in the store of "marbles," not in the "container."

Intelligence, then, is a product of learning. All people, except those who obviously are defective, have the same potential at birth —a special kind of inert emptiness unique to man. The intelligence they achieve stems from the opportunities for learning they have had. This supposedly means that the intelligence of any normal person can be improved indefinitely through imposed education; one's apperceptive mass can be expanded continuously and it has an unlimited capacity.

How Do Apperceptionists Explicitly Define Transfer?

According to apperception theory, a student's "subconscious mind" contains a quantity of dynamic perceptions, images, and feelings which have been accumulated during his experiences. Any one of these elements of the apperceptive mass stands ready to spring back into consciousness when the appropriate occasion occurs; it is ready to join the other mental elements with which it has an affinity.

By use of textbooks and lectures, apperceptionists "cover" their subject. Students, supposedly, learn the material, retain much of it in their apperceptive masses, and carry it over to meet future situations in and out of school. This information supposedly will be used whenever a situation arises in which it is needed. Appropriateness, however, is determined by the nature of the mental states or ideas, not by the person.

Mental states (sometimes called presentations) are stored in the form of sense impressions, copies of previous sense impressions or images, and affective elements such as pleaure or pain. Such mental states provide the total source of mental activity. Feelings and willings are secondary factors which are derived from original mental states. Consequently, volition or willing has its roots in thought; right thinking supposedly produces right action.

How Do Apperceptionists Promote Transfer?

Fundamentally, apperceptionists promote transfer by building up the apperceptive masses of their students. The Herbartian principles of association and frequency are the heart of apperception. The association principle is that, when a number of ideas form a mass, the combined powers of the mass determine the new ideas which will enter consciousness. The coordinate principle of frequency is that the more often an idea has been brought into consciousness, the easier it is for it to return. Application of these two laws leads teacher to emphasize frequent presentation of the *proper* ideas to students. Teachers are convinced that transfer is best when a goodly supply of ideas or facts and principles are stored for later use. If people know facts and principles pertinent to a given area of learning or living, they automatically will use them as appropriate occasions occur.

Apperceptive teaching, in order to maximize transfer, continues to follow the Herbartian five steps. This entails careful preparation and rigid employment of detailed lesson plans which outline and prescribe a fixed order of teaching and learning.[9]

Apperception, as a theory of transfer, has been a vital force in attacking its predecessor—mental discipline. However, the jump from the assumption that people innately are either bad and active or neutral and active to the assumption that they are inertly passive was not all to the good. John Locke's *tabula rasa* theory of mind upon which apperception is based is perhaps as vulnerable as is mental discipline. *Within apperception, transfer becomes completely a matter of mechanistic storage of ideas in an inert mind.* As such it implies that teaching is an indoctrination procedure. Thus, it throws schools out of harmony with the democratic structure of American society.

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[9] See Chapter 2, pages 42–43, for a description of these steps.

Some specific charges can be leveled against apperceptive principles and procedures in today's schools and the outlook on transfer which they imply. Since students completely depend upon the teacher, who provides all of the leadership in learning, critical thinking is discouraged and students tend to be docile. Facts are acquired for test purposes, then rapidly forgotten; their transfer value tends to be very low. Furthermore, problem-centered teaching is largely disregarded.

We should recognize, however, that, regardless of their shortcomings, apperceptionists have told us much about experience which otherwise might escape our attention. They have realized that when a person has a new experience there is a "reception committee" of background ideas which help him interpret it. Furthermore, they have noted that experiences, in some way, abide after they have been undergone, and that they have considerable influence in determining the nature of subsequent experiences.

Apperception was a connecting link which led the way for development of both mechanistic and purposive contemporary psychologies, which we examine next to see how they have treated the problem of transfer.

WHY DOES CONNECTIONISM EMPHASIZE IDENTICAL ELEMENTS?

The S-R bond or connectionistic theory of learning was developed by Edward L. Thorndike and his followers. Its basic thesis is that, through conditioning, specific response patterns come to be connected with specific stimuli. The theory of transfer that accompanies connectionism is transfer of *identical elements*.[10]

The identical elements theory of transfer means that learning is facilitated in a second situation to the extent that it contains identical factors or elements which occurred in an earlier learning situation. "Chief amongst such identical elements of practical importance in education are associations including ideas about aims and ideas of method and general principles, and associations involving elementary facts of experience such as length, color, and number, which are repeated again and again in differing combinations."[11] Identical elements may take the form of content, procedures, facts, actions, attitudes, techniques, or principles.

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[10] See Chapter 3, pages 54–57, for a description of connectionism.

The identical elements theory implies that a school should list the aspects of situations that are important out of school or in later courses and teach the pupil to cope with each specific one. Lists of spelling words are drawn from articles, letters, and documents written by adults. Likewise, reading vocabulary lists contain words that adults read in newspapers and magazines.

How Do Connectionists Define Learning?

Connectionism is "the doctrine that all mental processes consist of the functioning of native and acquired connections between situations and responses (Thorndike)."[12] The acquired connections, supposedly, are formed through random, not purposive, trial and error; they constitute learning. Since S-R bonds or connections are, in some way, the product of physiological changes in a nervous system, learning is closely associated with such neurological changes.

Three major laws of learning and five minor ones supposedly operate whenever acquired connections occur. Thorndike's major laws of learning are *effect, exercise or frequency,* and *readiness.*[13] His minor laws are *multiple response, attitude or set, partial activity, assimilation or analogy,* and *associative shifting.* More recently, in addition to the eight laws of learning, *belongingness, impressiveness, polarity, identifiability, availability,* and *mental system* also have appeared as special learning concepts in the vocabularies of connectionists.[14] Thus, connectionists have developed some 15 mechanistic laws or principles to encompass learning phenomena and pertinent research.

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[11] Edward L. Thorndike, *The Psychology of Learning,* Teachers College, Columbia University, 1913, p. 359.

[12] From Howard C. Warren, Ed., *Dictionary of Psychology,* Houghton Mifflin, 1934, p. 56.

[13] See Chapter 3, pages 55–56, for a description of Thorndike's major laws of learning.

[14] For a detailed treatment of both the major and the minor laws see Nelson B. Henry, Ed., *The Forty-First Yearbook of the National Society for the Study of Education, Part II, The Psychology of Learning,* University of Chicago Press, 1942, pp. 111–128.

How Do Connectionists Define Intelligence?

Connectionists and other S-R associationists regard intelligence as an innate, relatively fixed neural structure; once physiological maturity is reached it does not change. Specifically, intelligence is a person's capacity to form links in his nervous system between stimuli and motor responses, to retain these links, and to repeat the proper sequence of motion when confronted with a stimulus at any time in the future. Thorndike maintained that a person's intelligence is *represented* by the sum total of the bonds he has formed. However, he also made clear that intelligence is not the bonds themselves but the capacity to form them; it is a function of the way an organism is put together.

Since, to connectionists, intelligence has a physiological basis and a given person's neural structure is not likely to change, it is only logical to suppose that the potential of an organism for intelligent behavior also will not change. And indeed, this is what the generation of associationists who were in the forefront during the 1920s and 1930s did believe. The two traits crucial to intelligence—complexity and modifiability of the nervous system—supposedly are transmitted from parents to offspring. Thus, connectionistic psychologists have thought that intelligence, like other physical traits, is determined by physical inheritance, and that its level, once maturity is reached, is constant for each individual, just as are the colors of his eyes and skin.

Thorndike divided intelligence into three kinds: mechanical, social, and abstract. He thought that each kind is manifested by the quality of responses which a person can make to stimuli in whichever of the three areas is involved. A person might have a high degree of mechanical intelligence without corresponding levels of social and abstract intelligence. In this case he would be highly competent in working with, say, motors but might be ineffective in working with other persons or solving problems in higher mathematics. Similarly, a person might be extremely adept in persuading others, in which case he might perform brilliantly as a salesman;

but be incapable of changing a tire or passing an introductory philosophy course. Furthermore, a person might be extraordinarily able in dealing with abstract, ideological matters and yet highly inept socially and mechanically.

How Do Connectionists Define Transfer of Learning?

Connectionists regard human activities of all sorts as responses made by human organisms to stimuli or stimulus situations. A stimulus or stimulus situation is any event which influences a person. A response includes all components of any unified, organic behavior.

When identical elements occur in two learning situations, transfer from the first to the second supposedly is automatic. Since, for connectionists, what one learns basically is a group of reactions to a complex situation, reactions are the elements that are transferred to new situations. However, for transfer to occur, learning situations must be of such nature that they contain some of the same reactions. For example, transfer from a study of Latin to English depends upon the extent to which there are identical elements or reactions in the two learning procedures.

In 1912 Thorndike stated, "When any response has been connected with many different situations alike in the presence of one element and different in other respects, the response is thereby bound to that element so that when that element appears, even in a very different total situation, it will tend to evoke that response."[15] The following year, he wrote, "A change in one function alters another only insofar as the two functions have as factors identical elements."[16] According to Thorndike's view as expressed in these quotations, transfer takes place from one learning situation to another only to the extent that there are identical aspects in the two. This means that transfer supposedly takes place from playing a piano to typing to the extent that such skills as eye-finger coordination are identical to both operations. However, elements of similarity between two situations are not necessarily restricted to skills. They might take the form of information, principles, procedures, or attitudes. Furthermore, identity of elements can be in either subject matter or procedures; thus, learning is facilitated in a second situation to the extent in which it includes any factors or elements which occurred in the first.

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[15] Edward L. Thorndike, *Education,* Macmillan, 1912, p. 99.

[16] Edward L. Thorndike, *The Psychology of Learning,* Teachers College, Columbia University, 1913, p. 358.

Thorndike's colleagues and followers have recognized that stimulus and response generalization are basic processes in transfer. However, they have limited the generalization concept to characterization of stimuli and responses, and made very little, if anything, of teaching for generalizations as such. They noted that if an animal learns to respond to a given stimulus, it will tend to react likewise to related stimuli. For example, when a dog learns to salivate at one tone, he also will salivate in response to similar tones. To connectionists, *response generalization* occurs when a person learns to perform an act with one part of his organism and then is able to perform the same act, perhaps not so proficiently, by another segment of his organism. For example, in bilateral transfer, skill acquired with one hand, foot, or eye is transferred to the other.

How Do Connectionists Promote Transfer of Learning?

Since, according to connectionism, each person is limited by his inborn neural structure, the most that education can do is to take advantage of what capacity a child or youth has for forming dependable S-R linkages. A person's capacity for intelligent behavior depends upon how many links can be formed and retained. Hence, the best—in fact, the only—way education can serve humanity is to condition students efficiently.

Thorndike's studies had convinced him that the methods used in guiding a pupil's learning activities had great effect upon the degree of transferability of his learning. He thought that teaching specifically for transfer is the only method of teaching that is "worth its salt." He was convinced that knowledge should consist of well-ordered groups of connections which are related to each other in useful ways and whose inner relationships correspond to those of the real world. Furthermore, he taught that, the more clearly the crucial elements or facts or principles in a situation are brought to the pupil's attention, the more readily the same element or fact or principle may be identified in another situation.[17]

The identical elements principle, when applied to curriculum matters, means *specific objectivism*. Schools are encouraged to decide exactly what students should be taught and to teach these directly, not through some roundabout means. Consequently, if a student is to learn English grammar, the most effective way of his doing this is to learn English grammar, not to attack English grammar by way of Latin or some other foreign language.

Although, according to the theory of identical elements, study of Latin does not discipline either mental faculties or a generalized mind, it supposedly does contribute to transfer to the degree that there are identical elements in Latin and English vocabularies. The "port" of Latin *portare* (to carry) supposedly does transfer to the "port" of English *transport*. Consequently, in accordance with identical elements, if Latin is taught at all, emphasis should be placed upon roots or segments which are identical with those in English. However, even then the study of Latin roots of English words as they apply to English is more economical in learning English than is the study of Latin as a language.

If one tries to base a school program on the identical elements conception of transfer, his only choice is to incorporate in the curriculum as many learning tasks as possible which, when reproduced outside of school, will contribute to the effectiveness of living. An entire generation of curriculum makers in the 1920s and 1930s, led by Franklin Bobbitt and Werrett W. Charters, did, in fact, adopt this approach. They studied American community life much as an efficiency expert would conduct time-and-motion studies in a factory. They then tried to list specific verbal and motor responses which are needed in daily life and to teach these, with only minor modification, in school.

This approach to education poses many difficulties, not the least of which is that there are so many kinds of situations in life to be faced that a school cannot possibly teach them all, even in the 12 or 13 years of required attendance. Thus, curriculums tend to become cluttered with too many specific objectives, many of which conflict with one another.

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[17] See Edward L. Thorndike and Arthur I. Gates, *Elementary Principles of Education*, Macmillan, 1929, p. 104.

Under such a situation, someone must decide for each school *which* among the hundreds of thousands of possible learnings that might be justified are important enough to be taught. Who is to make this decision? Almost everyone will claim the right—legislators, businessmen, labor leaders, patriotic organizations, unpatriotic organizations, parents, school boards, school administrators, and occasionally even a teacher who has the courage to express an opinion.

Much research has been devoted to evaluation of the identical elements theory of transfer. In 1941, Pedro T. Orata, who has concentrated his professional study upon transfer of learning, wrote, "The evidence which tends to disprove Thorndike's theory of identical elements continues to cumulate. . . ." He continued, "Not a simple succession of elements is transferred, but rather an attitude of response or a way of seeing the same kind of solution for different problems. Whereas senseless learning does not transfer, meaningful learning does. The process of learning for transfer becomes one of organization and reorganization of experience."[18]

Orata also lists some conclusions that have developed from his studies. He notes that, although transfer is found in approximately 80 percent of studies, it is not an automatic process which may be taken for granted, and the amount of transfer is influenced by many factors. Factors centered in the learner are age, mental ability, personality, stability attained by a learned pattern, knowledge of direction, attitude toward the learning situation, efficient use of past experience, accuracy of learning, and acceptance of methods, procedures, principles, sentiments, and ideals. Factors centered in the learning situation are meaningfulness of the learning situation, suitable organization of subject matter presentation, and provision for continuous reconstruction of experience.

The identical elements theory affirms that transfer occurs, but may not adequately explain how. Some critics of identical elements theory interpret it as really a fragmented faculty psychology; elements in learning may be construed as "small faculties." In discussing the identical elements theory of transfer, Bayles points out, "After all, such a theory is fundamentally the same as the faculty theory because all one needs to do is to divide faculties into sufficiently small units and, behold, one will have identical elements."[19]

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[18] Pedro T. Orata, "Recent Research Studies of Transfer of Training with Implications for the Curriculum, Guidance, and Personal Work," *Journal of Educational Research,* October, 1941, p. 83.

WHAT DOES SKINNER'S OPERANT CONDITIONING IMPLY ABOUT TRANSFER OF LEARNING?

Skinner's operant conditioning theory of learning carries with it definite implications in regard to the nature of transfer and its role in teaching and learning. Since the transfer theories of most contemporary S-R associationists are much like Skinner's, we may consider his position representative of modern S-R associationisms.

Since Skinner questions the reality of the inner qualities and faculties to which human achievements in the past often have been attributed, in his study of learning and transfer he turns from ill-defined and remote explanations of behavior to the study of observable and manipulatable behavior. He feels that there is nothing to be lost by applying positivistic science to education and moral discourse, and that any resistance to this movement is only an expression of culture lag.

How Does Skinner Define Learning?

Operant conditioning is the learning process within which a response or operant is brought to be more probable or frequent through being reinforced by a change in an organism's environment after the operant or response occurs.[20] In this process there is no necessary connection of stimuli and responses; reinforcement simply increases the probability of a response or class of responses; a reinforcing stimulus is a discriminating not a connecting one.

Because of his physicalistic commitment (a physicalist is one who holds human thoughts and actions to be determined by physical laws), Professor Skinner accounts for the probability of responsive behavior in terms of the genetic endowment of an organism and its past and present environment. All of this he describes wholly in the language of physics and biology. Consequently, he states, "I do not see any distinction between predicting what an individual is going to do and predicting what, let us say, a sailboat is going to do."[21] "Operant conditioning shapes behavior as the sculptor shapes a lump of clay."[22]

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[19] Ernest E. Bayles, *The Theory and Practice of Teaching,* Harper & Row, 1950, pp. 91–92.

[20] See Chapter 5 for a more extensive treatment of operant conditioning.

Through receiving reinforcement of slightly varied instances of his behavior, a child supposedly learns to raise himself, stand, walk, grasp objects, and move them about. Later on, through the same process, he learns to talk, sing, dance, and play games—in short, to exhibit the enormous repertoire characteristic of a normal adult. Furthermore, in a world in which ethical training is widespread, most men are reinforced by succeeding in reinforcing others. Thus, personal gratitude is a powerful *generalized reinforcer* (see pages 270–271).

A list of values actually is a list of reinforcers. "People behave in ways which, as we say, conform to ethical, governmental, or religious patterns because they are reinforced for doing so."[23] An organism can be reinforced by, that is, it can be made to "choose" almost any given state of affairs. Literature, art, and entertainment are contrived reinforcers. Whether a person buys a book, a ticket to a performance, or a work of art depends upon whether it is reinforcing to him, and usually it is reinforcing to him if he had been reinforced when he previously purchased such an article.

How Are Genetic or Hereditary Factors Related to Operant Conditioning?

Skinner thinks that the most that can be said for the genetic factors in human behavior is that knowledge of them may enable us to make better use of other causes of behavior. Behavior and learning require a biological organism which is the product of a genetic process. However, heredity, as the layman uses the term, is a fictitional explanation of behavior. Since a hereditary condition cannot be manipulated after the individual has been conceived, heredity is of little value in any experimental analysis designed for practical control of human behavior.

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[21] B. F. Skinner, *Cumulative Record,* Appleton-Century-Crofts, 1961, p. 201.

[22] B. F. Skinner, *Science and Human Behavior,* Macmillan, 1953, p. 91.

[23] Skinner, *Cumulative Record,* p. 34.

For Skinner, any innate behavior is in the form of unlearned reflexes. A reflex has been called such on the theory that, in its operation, the disturbance caused by a stimulus passes to the central nervous system and is reflected back to the muscles or glands. Although Skinner does not give reflexes the dominant position in his behavioral theory, he definitely recognizes both innate and conditioned ones. However, he notes that if we were to assemble all the behavior which falls into the pattern of the simple reflexes we would have only a very small fraction of the total behavior of an organism.

Innate or hereditary reflexes primarily activate the internal economy of an organism where glands and smooth muscles are operative. When dust blows into an organism's eyes, he reflexively washes it out with a profuse secretion of tears, or when food enters the stomach, peristaltic action is stimulated. However, in addition to the internal reflexes, there are also some external innate reflexes, such as the startle reflex at the sound of a loud noise.

Skinner notes that reflexes, particularly innate ones, are of little importance when we study overt behavior. However, he believes that responsible behavior is determined by environmental stimuli just as are the reflexes. He states, "We do not hold people responsible for their reflexes—for example, for coughing in church. We hold them responsible for their operant behavior—for example, for whispering in church or remaining in church while coughing. But there are variables which are responsible for whispering as well as for coughing, and they may be just as inexorable. When we recognize this, we are likely to drop the notion of responsibility altogether and with it the doctrine of free will as the inner causal agent."[24]

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[24] Skinner, *Science and Human Behavior*, pp. 115–116.

What Is Transfer in Operant Conditioning?

Since within operant conditioning learning is simply a change in the probability of a response, transfer likewise is an increased probability of responses of a certain class occurring in the future. Remember that a reinforcer is any stimulus whose presentation or removal increases the probability of a response; there are both positive and negative reinforcers.[25] Because a single instance of a response or operant may be strengthened by being followed by a reinforcing event and the effect survive for a long time even though the same consequence never recurs, operant reinforcement provides a strong theoretical basis for transfer.

Skinner thinks that nearly all human behavior is the product of operant reinforcement and most reinforcement improves the efficiency of behavior through continuously reshaping it. He writes, "While we are awake, we act upon the environment constantly, and many of the consequences of our actions are reinforcing. Through operant conditioning the environment builds a basic repertoire with which we keep our balance, walk, play games, handle instruments and tools, talk, write, sail a boat, drive a car, or fly a plane. A change in the environment—a new car, a new friend, a new field of interest, a new job, a new location—may find us unprepared, but our behavior usually adjusts quickly as we acquire new responses and discard old."[26] Thus, to Skinner's way of thinking, one's repertoire of conditioned operants is the basis for transfer of one's learning.

The two key concepts in understanding the meaning of transfer within operant conditioning are *conditioned reinforcement* and *induction.*

CONDITIONED REINFORCEMENT. In *conditioned reinforcement,* a new reinforcer (stimulus B) is conditioned through its occurrence along with an originally adequate reinforcing stimulus (stimulus A). Thus, (stimulus B) comes to reinforce an act operantly in the same way as would the originally adequate reinforcing stimulus (stimulus A).

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[25] See Chapter 5, page 129.

[26] Skinner, *Science and Human Behavior,* p. 66.

An example of conditioned reinforcement is that, if each time we give food to a hungry pigeon to reinforce an act which we are teaching him, we turn on a light, the light eventually will become a conditioned reinforcer; it may be used to reinforce the act or some other operant just as food formerly was used.[27] "If we have frequently presented a dish of food to a hungry organism, the empty dish will elicit the animal's salivation. To some extent the empty dish will also reinforce an operant."[28] Thus, through conditioned reinforcement, other things may acquire the reinforcing power which food, water, and sexual contact originally had.

A characteristic of human behavior is that primary—originally adequate—reinforcers may be effective even after long delays. This presumably is only because in intervening events other objects such as symbols become conditioned reinforcers. In education, techniques are deliberately designed to create appropriate conditioned reinforcers and thereby transfer is promoted. When a student performs properly, the teacher gives him a smile and an A. An A thereby comes to be a conditioned reinforcer; it will "reward" the student for many kinds of activity—operants.

INDUCTION. Skinner prefers the term *induction* for what more commonly is called stimulus or response *generalization*. Thus induction occurs in regard to both stimuli and responses; that is, there is both stimulus induction and response induction.[29]

Stimulus induction is a process through which a stimulus acquires or loses the capacity to elicit a response, control a discriminative response, or set up an emotional "state," because of its similarity to a stimulus which has acquired or lost such a capacity through direct conditioning. If a red light is established as a discriminative stimulus, an orange (or even yellow) light may be found to share the same function, perhaps in a lesser degree.

Response induction is a process through which a response changes its probability or rate because it shares properties with another response which has changed its probability or rate through reinforcement. When a dog has been trained to roll over by being rewarded and he is "told" to "roll over," he may make a twisting motion while remaining on his feet.

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[27] See "How To Teach Animals," in B. F. Skinner, *Cumulative Record,* Appleton-Century-Crofts, 1961, pp. 412–419.

[28] Skinner, *Science and Human Behavior,* p. 76.

[29] See B. F. Skinner, *Schedules of Reinforcement,* Appleton-Century-Crofts, 1957, p. 728.

For us to understand Skinner's induction theory, we must remember that reinforcement does not strengthen the response which preceded it; it increases the probability of a class of responses, and the class is represented by certain specific responses which occur in the future. Furthermore, we must keep in mind that a class of responses consists of those responses containing the same elements. Thus, Skinner's basic measure of behavior is a response element rather than a response itself. A response element ". . . is a sort of behavioral atom, which may never appear by itself upon any single occasion but is the essential ingredient or component of all observed instances. The reinforcement of a response increases the probability [of occurrence] of all responses containing the same elements."[30]

A large complex of words—an idiom, a phrase, or a memorized passage—may be under the control of a single variable and thus constitute a functional unit.[31] Functional units of behavior, however, consist of a number of basic *behavioral atoms* or elements. Behavioral atoms, as contrasted with functional units, are at least as small as separate speech sounds. We must recognize these small behavioral atoms in order to account for distorted verbal responses such as spoonerisms and other verbal slips (a spoonerism is an accidental transposition of sounds—saying "blushing crow" for "crushing blow"). These "atoms" also are evident in the stylistic devices of alliteration, rhyme, and rhythm. When we identify elements rather than responses as units of behavior, we then say ". . . the *elements* [atoms] *are* strengthened wherever they occur."[32]

In the life of each organism, through the process of stimulus and response induction, there is constant movement from primary to generalized reinforcement. Usually, in this process, it is a conditioned reinforcer which is being generalized.

CONDITIONED, GENERALIZED REINFORCEMENT. Conditioned reinforcement and induction or generalization combine to give conditioned generalized reinforcement. A stimulus which is a conditioned reinforcer is generalized when, in the process of its becoming a conditioned reinforcer, it is paired with more than one primary reinforcer. ". . . if a conditioned reinforcer has been paired with reinforcers appropriate to many conditions, at least one appropriate state of deprivation is more likely to prevail upon a later occasion."[33] Thus, a response is more likely to occur. For example, when we reinforce behavior with money, our subsequent control of the behavior of an individual is relatively independent of any momentary deprivation. Money becomes a generalized reinforcer because many primary reinforcers are received while being paired with money.

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[30] Skinner, *Science and Human Behavior*, p. 94.
[31] *Ibid.*, pp. 94–95.
[32] *Ibid.*, p. 94.

Skinner observes that a token such as money is a generalized reinforcer distinguished by its physical specifications. He further notes that money is not the only token that is a conditioned generalized reinforcer. In education an individual behaves as he does, in part, because of the marks, grades, and diplomas which he previously has received. These are not as readily exchanged for primary reinforcement as money, but the possibility of exchange is there. Educational tokens form a series in which one token may be exchanged for the next, and the commercial or prestige value of the final token, the diploma, is usually quite clear.

How Is Transfer Promoted in Operant Conditioning?

For Skinner, "Education is the establishing of behavior which will be of advantage to the individual and to others at some future time."[34] Thus, the teacher is the architect and builder of behaviors. Within the building process a teacher is to supply arbitrary and sometimes spurious consequences for the sake of feedback—reinforcement.

Skinner's criticism of many of today's teaching procedures is not that there are no reinforcers operating, but that the ones that do operate mostly reinforce merely going to school and gaining a diploma or a degree. There is a woefully inadequate number of reinforcers for the subject matter elements themselves.

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[33] *Ibid.*, p. 77.
[34] *Ibid.*, p. 402.

As stated in Chapter 5, the first task of a teacher is to shape up proper responses, such as pronouncing and writing correctly. However, the principal task of the teacher is to bring these correct behaviors under many sorts of stimulus control. Thus, in the education of a child for future constructive behavior, four basic questions must be faced: what behavior is to be set up, what reinforcers are at hand, what responses are available in embarking upon a program of progressive approximation which will lead to the final form of the behavior, and how can reinforcement be most efficiently scheduled in maintaining the behavior in strength? The last question states the problem of enhancement of transfer as it is understood by operant conditioning theorists.

The maintenance of behavior in strength after it has been acquired is as much a function of reinforcement as is the original learning. After an organism has learned how to do something, that is, after it has acquired behavior, further reinforcements are necessary to maintain the behavior in strength. In this process, various schedules of reinforcement are of special importance.[35]

HOW DID GENERALIZATIONS BECOME THE KEY IDEA IN TRANSFER?

Let us review the results of an experiment which was performed in 1924 and see if we can discern the *learning elements* that were involved. Knight gave two groups of children of equal ability and equally ready for the topic the same amount of instruction in addition of fractions. Group A practiced on fractions which had as denominators 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 15, 16, 18, 21, 24, 28, and 30. Group B practiced only on fractions having as denominators 2, 4, 6, 8, 12, and 24, and depended upon transfer for the learning of the addition of fractions with other denominators. After their period of instruction the two groups were tested for their ability to add fractions with denominators of 3, 5, 7, 9, 14, 15, 18,

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[35] See Chapter 5, page 117, for discussion of schedules of reinforcement.

21, 28, and 30. These were the fractions which were taught to Group A but not to Group B. On their test, Group A scored only slightly better than Group B. Group B's score indicated that the group achieved almost complete transfer from mastery of the specifically taught fractions to mastery of the fractions which were not specifically practiced. Do the results of this experiment support or weaken the positions of connectionism, operant conditioning, and other atomistic, associationistic psychologies?[36]

Between 1915 and 1920, two of the most eminent educational psychologists of the time, Edward L. Thorndike and Charles H. Judd (1873–1946), carried on a running debate in regard to the nature of transfer. Whereas Professor Thorndike continued to champion his identical elements theory, Professor Judd insisted that generalizations, not identical elements, were transferred to new situations. Thus, the basic educational issue in this period was identical elements vs. generalization-of-experience. This issue centered upon the nature of transfer of learning, and it has persisted through the years up to the middle of the twentieth century. Followers of Judd are convinced that the degree of transfer of learning which occurs depends upon the extent to which the products of learning are consolidated into generalizations. A generalization is a characteristic common to many situations.

How Are Generalizations Learned?

Judd recognized two possible kinds or levels of learning: rote memorization with little, if any, meaning, and generalized knowledge with many intellectual associations. He placed very little value on the first level and a high premium upon the second. He was convinced that knowledge always should be in the form which makes generalizations possible; that is, it should have many intellectual associations and many possibilities of new associations. He even emphasized his generalizations theory when discussing the teaching of basic skills. He stated, ". . . when new skills are cultivated by an individual, the muscles are brought into coordinated action through elaborately organized patterns developed in the nervous system."[37] Furthermore, ". . . generalizations which epitomize great numbers of experiences are the highest products of racial and individual intellectual effort."[38]

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[36] Frederick B. Knight, "Transfer Within a Narrow Mental Function," *Elementary School Journal,* June, 1924, pp. 780–788.

How Did Judd Deal with Intelligence?

Judd's position in regard to the meaning of intelligence can be summarized with one quotation. "The only conclusion which can properly be reached when all the facts are considered is that both heredity and environmental influences make indispensable contributions to personality. The function of the educational system is to guide development in such a way as to produce well-balanced personalities in which inherited and acquired traits are properly related to one another."[39] Thus, we can see that he made a sharp distinction between hereditary and environmental influences.

In writing about intelligence Judd obviously assumed it to be a hereditary factor which might be described in different ways and measured in different terms. He construed education to be a process of imposition of environmental influences upon a hereditarily determined biological organism which, through its development, recapitulates—retraces—the various stages in the history of man.

What Is the Generalizations Theory of Transfer?

A generalization is a statement or understanding of relationships. It may also be called a principle, rule, or law. "Generalization is another name for the relating of experiences in such a way that what is gained at one point will redound to the advantage of the individual in many spheres of thought and action."[40]

For Judd and contemporary generalization theorists, transfer is the sensed relationship between the elements of a situation. Judd, like Herbart, Thorndike, and the mental disciplinarians, and unlike Gestalt-field theorists, considered transfer to be automatic. He expected a generalization to spring into action whenever the environment set the stage for its occurrence. Thus, we should recognize that either Thorndike's emphasis upon the *commonness of elements* or Judd's emphasis on the *appropriateness of generalization* makes the environment the determining agency in transfer.

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[37] Charles H. Judd, *Educational Psychology,* Houghton Mifflin, 1939, p. 496.

[38] *Ibid.,* p. 514.

[39] *Ibid.,* p. 452.

[40] *Ibid.,* p. 514.

Judd's dart-throwing experiment to test the value of generalizations has become something of a classic. Success in hitting a target under water requires readjustment of one's ordinary habit of throwing a dart. Since the light which comes from the target is refracted as it leaves the water, there is an apparent displacement of the target. Judd selected two groups of boys comparable in those variables which seemed relevant. One group, the experimental one, was instructed in the principle of—generalization in regard to—the refraction of light; the other, the control group, was not. Both groups of boys were then asked to throw darts in such a way as to hit underwater objects with them. At the beginning of the experiment, none of the boys had any skill in throwing darts.

Both groups of boys were instructed to hit targets placed 12 inches under water. The boys who had had theoretical training in the principles of refraction did as poorly at this first task as did the control group; they had to learn to throw darts before their theoretical training could help. Once this was accomplished, the target was moved to a position 4 inches under water. Immediately the experimental group showed a conspicuous superiority over the control group. Their understanding of the nature of refraction had given them cues as to where to aim the darts in order to hit underwater objects which are not where they appear to be. Judd's experiment and his interpretation of it is related in detail in his various books.[41]

More recent research supports Judd's position. In 1957, Kittell measured the relative effects of three amounts of direction on sixth graders' discovery of established principles on transfer to differing situations and on their retention of learned principles.[42] He concluded that, "Evidence from this experiment in conjunction with that of similar experiments indicates that furnishing learners with information in the form of underlying principles promotes transfer and retention of learning principles and may provide the background enabling future discovery of new principles."[43]

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[41] *Ibid.*, pp. 507 ff.

[42] Jack E. Kittell, "An Experimental Study of the Effect of External Direction During Learning on Transfer of Retention of Principles," *Journal of Educational Psychology*, November, 1957, pp. 391–405.

How Are Generalizations Promoted?

Since, for Judd, ". . . the most effective use of knowledge is assured not through the acquisition of any particular item of experience but only through the establishment of associations which illuminate and expand an item of experience so that it has general value,"[44] students should be taught the advantages of generalization by every possible device. "The preventive for the narrowness of school teaching and for lack of transfer is to be sought in the organization of instruction in such a way that the learner will constantly be made to see the broad relations of items of experience."[45]

Judd's position paralleled similar, but not identical, findings by the Gestalt-field psychologists. Köhler, Koffka, Wheeler, Perkins, and other Gestalt-field psychologists[46] all insisted that what lower animals and human beings tend to learn in any meaningful learning situation is relationships. (However, Gestalt-field psychologists imputed a purposiveness to behavior which Judd could not see.) Statements of such relationships are theories, generalizations, principles, rules, or laws which, as Judd said, are ". . . a kind of summary of many experiences. It [theory] makes possible the proper interrelating and interpreting of a whole body of varied experiences."[47]

Since accumulated experimentation has shown that attempts to base transfer on identical elements leads to more problems than it solves, and since the generalization theory of Judd and the Gestalt-field psychologists seems highly productive as a basis for transfer, many educational psychologists today prefer some form of the generalization theory. However, we should recognize the sharp differences which exist among adherents of the generalization theory. *The position of Judd and his followers was decidedly different from that of contemporary cognitive-field psychologists. This difference is epitomized by the statement that whereas Judd adhered to a mechanistic concept of transfer, cognitive-field psychologists see transfer of learning always in the frame of reference of purposive intellectual pursuits.*

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[43] *Ibid.*, p. 404.

[44] Charles H. Judd, *Educational Psychology*, Houghton Mifflin, 1939, p. 500.

[45] *Ibid.*, p. 514.

[46] See Chapter 3 for an account of the work of these men.

[47] *Ibid.*, p. 509.

Some Gestalt psychologists and all cognitive-field theorists feel that Judd and most other investigators of the generalization hypothesis stopped short of a fully adequate statement of the conditions of transfer. It is increasingly apparent that the achievement of a generalization by a student does not in itself guarantee that transfer will take place automatically.

Cronbach's recent statement stops just short of mentioning that for transfer to occur students must be motivated toward that end. He writes, *"Transfer of a behavior pattern to a new situation is likely to occur whenever the person recognizes the new situation as similar to other situations for which the behavior has been appropriate."*[48] Cronbach, further, points out that to facilitate transfer a student needs to learn general principles, that these principles must be clearly understood, that students must be shown places in which the principles can apply, and that they must be given an opportunity to recognize the applicability of the principles in increasingly varied and complex situations. All this is excellent as far as it goes, but it still leaves out the one perhaps most important ingredient which, to cognitive-field theorists, seems indispensable—the motivation of students. Do they desire to use the insights or understandings they have acquired?

In his discourse on the promotion of transfer, Judd emphasized that the effects of school instruction depend on the way in which the minds of pupils operate rather than upon the subject matter which they study, and that the same content of knowledge may have very different values because of the way in which the content is acquired by different individuals. Nevertheless, he never quite crossed over into seeing that the essential ingredient in transfer is the person's desire to use an insight that he already has gained. He recognized that human intelligence brings to the solution of each problem encountered by an individual a vast body of personal and social experience in the form of generalizations, but he seemed to fail to see that use of "human intelligence" involves a desire to use it.

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[48] Lee J. Cronbach, *Educational Psychology*, 2nd ed., Harcourt, Brace & World, 1963, pp. 318–319.

HOW DO GESTALT-FIELD PSYCHOLOGISTS DEFINE TRANSFER?

Gestalt-field psychologists think that transfer of learning occurs because of perceptual similarities between two situations, and that it is in the form of generalizations, concepts, or insights which are developed in one learning situation and are usable in others. However, to Gestalt-field psychologists, it seems as futile to expect a generalization to spring into action whenever the environment sets the stage as to expect such of a faculty or of an identical element. For us to promote transfer in a dependable way, something more than commonness of elements or appropriateness of generalizations is necessary.

Experience shows that in actual practice transfer of a generalization will not always occur even when a person understands a principle thoroughly and has applied it often. A natural scientist repeatedly can be scientific in dealing with problems of natural science and simultaneously resort to folklore and superstition in dealing with problems of the social sciences and humanities. He either may not recognize that scientific method is applicable to problems in the social sciences and humanities, or he may recognize such applicability but have no desire to use it in the other areas of endeavor.

How Do Gestalt-Field Psychologists Define Learning?

For Gestalt-field psychologists, learning is a change or reorganization of insight or cognitive structure. In other words, it is a change in knowledge, skills, attitudes, values, or beliefs, and may or may not have anything to do with change in overt behavior. One does not "learn by doing" except insofar as one's doing contributes to one's change in cognitive structure. For learning to occur, doing must be accompanied by realization of consequences. Thus, learning occurs through, and as a result of, experience. Learning, then, involves the catching, and generalization, of insights which often are first caught on a nonverbal level—the level of "feel"; they may be verbalized at the time of their catching, at some later time, or not at all.

In learning, our tendency is to "generalize" our insights—to hypothesize, or get a hunch that they will work in other instances where conditions are similar. We then test the validity of these generalizations by trying them in active experiences. If they have no predictive value, they drop by the wayside. If they do have predictive value, they become a part of our intellectual make-up and contribute to intelligent behavior until they are changed or discarded.

What Do Gestalt-Field Psychologists Mean by Intelligence?

In keeping with their definition of learning, Gestalt-field psychologists define intelligence as that capacity to act with dependable foresight which is the product of the interaction of a person and his perceived (psychological) environment. Since intelligence is one's capacity for accurate foresight, it is revealed in one's ability to solve problems in areas of one's concern.

This conception of intelligence assumes that problem-solving ability, although influenced by hereditary factors, is susceptible to change in a normal person and can improve through education. If one's education includes not only opportunity for problem solving but also opportunity to study the problem-solving process as a process and to achieve generalized insights about it, most new problems, it is assumed, will be approached more intelligently than they would have been before. Thus, as a person acquires more, and more adequate, generalized insights he becomes more intelligent.[49]

[49] Some scholars with the Gestalt-field orientation make a distinction between "intelligence" and "wisdom" or "discernment." So distinguished, intelligence is *capacity* to form insights, and wisdom or discernment is *possession* of tested or dependable insights. However, a broader definition of intelligence to cover not only that capacity which a person has as a result of innate ability but also his learned ability seems more practicable for a basic text in learning theory. See Ernest E. Bayles, *Democratic Educational Theory*, Harper & Row, 1960, p. 101.

Men, and other animals, develop insights not only to learn but also to learn how to learn. Harry F. Harlow, a psychologist who has experimented extensively with animals writes as follows: "The learning of primary importance to the primates, at least, is the formation of learning sets; it is the *learning how to learn efficiently* in the situations the animal frequently encounters. This learning to learn transforms the organism from a creature that adapts to a changing environment by trial and error to one that adapts by seeming hypothesis and insight."[50]

Exponents of Gestalt-field theory, more than representatives of any other system of modern psychology, have emphasized that capacity for intelligent behavior is modified by learning. Advocates of the Gestalt-field position do not like to talk in terms of any limitations of intelligence. For example, Combs and Snygg tell us, ". . . the possibilities for human perception seem almost infinite. Given a healthy physical organism to provide the vehicle for perception, enough time, a stimulating environment, challenging and fruitful problems, and a nonrestrictive self-concept, there seems no end to the perceptions possible to the individual."[51] Given the proper conditions there is no reason why the intelligence of a person should not increase during his entire lifetime. Of course, old age may produce physiological deterioration which reduces the capacity for differentiating new perceptions. On the other hand, it is possible to cite numerous cases of persons who have retained a remarkable capacity for intellectual growth and creativity until the age of 90 or beyond.

In consideration of the foregoing point of view concerning flexibility of intelligence, a word of caution is necessary. It is by no means easy for a person continuously to improve the number and quality of his perceptions. Although one's perceptual field, or life space, undergoes continuous modification, these changes tend to apply to minor attitudes, values, and beliefs—to items which are not central to one's personality structure. Religious convictions, for example, are not likely to change readily—not, for example, like one's taste in clothing or automobiles. The essential ingredients for continued growth in intelligence are open-mindedness to new ideas and willingness to criticize one's most cherished convictions. Since for most persons attainment of these ingredients is very difficult, their intelligence quotients, as revealed by any known measuring device, do not change markedly over the course of time; and in the case of some persons the IQ remains stable, or may even regress. There is reason to suppose, however, that one's degree of open-mindedness and one's ability for self-criticism are largely functions of his education.

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[50] Harry F. Harlow, "The Formation of Learning Sets," *Psychological Review*, January, 1949, p. 51.

[51] Arthur W. Combs and Donald Snygg, *Individual Behavior*, rev. ed., Harper & Row, 1959, p. 216.

In assessing the basis of intelligence, Gestalt-field theorists assume that both poles—person or self and psychological environment—are important, but that it is impossible to assess the relative importance of either.

In the interactive process, the quality of perception is of crucial importance. A person may have a physical organism of excellent quality, but his perceptions of himself and his environment may, because of previous learnings, be extremely faulty. Conversely, a person may have a mediocre physical organism, but, because of previous learnings, his perceptions may be first rate. Since there is no known way at present of determining the relative importance of innate physical structure and acquired learning as a source of intelligence, we, as teachers, may relegate this issue to an area of little functional importance.

One qualification is necessary: perception hinges in part on the efficiency of sensory organs and other physical structures. If the goal is to pounce on a field mouse, then a high-flying eagle can behave more intelligently than a man; not only does his position vis-à-vis the mouse confer an advantage, but he can *see* more acutely. Obviously, poor eyesight, deafness, "taste blindness," and other sensory defects reduce the capacity for dependable perception. On the other hand, man as well as other creatures often can go far in compensating for impaired sensory capacity; for example, consider Helen Keller.

How Does Gestalt-Field Psychology Define Transfer of Learning?

Gestalt-field psychologists note that when transfer of learning occurs, it is in the form of generalizations, concepts, or insights which are developed in one learning situation and employed in others; this process is called *transposition*. Consequently, for learning to be most useful in future situations, it is essential that insights that are gained be generalized. But even then we cannot safely assert that transfer of generalizations takes place automatically. For transfer to occur, a learner not only should generalize, he also should understand how the generalization can be used, and he should have a desire to use it.

In the recent writings of Ernest E. Bayles, he tells us that *"Any given item of training will transfer if and when—and only if and when—*(1) *opportunity offers,* (2) *a trained individual sees or senses it as an opportunity, and* (3) *he is disposed to take advantage of the opportunity."*[52] In this statement, we take it that "item of training" may be defined as "an insight susceptible to generalized application."

Transposition of insights may also be described in terms of habits. A habit is a skillfully executed application of a principle in a situation wherein application of that principle apparently will help a person achieve a goal. Even habits are not blind, automatic behaviors. Rather, they are precise adjustments to situations which call for them. They are products of tested insights which are used in new situations. One may operate on habit, and transfer may occur with little or no reflection. Or transfer may occur in a highly reflective situation. In either case, transfer is not automatic.

How Do Gestalt-Field Psychologists Promote Transfer?

A person is in the best frame of mind for transfer to occur when he is aware of his acquiring meanings and abilities which are widely applicable in learning and living. However, important as this is, for Gestalt-field psychologists it is not enough; a person must want and try to solve new problems in the light of his insights gained through previous experience. For transfer to occur, individuals must perceive common factors in different situations, they must comprehend them as applicable and appropriate to both, and they must desire to benefit by the sensed commonality.

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[52] Ernest E. Bayles, *Democratic Educational Theory,* Harper & Row, 1960, p. 58.

Furthermore, Gestalt-field theorists are committed to the proposition that transfer of learning to new tasks will be better if, in learning, the learner can discover relationships for himself, and if he has opportunities to apply his learning to a variety of tasks. Consequently, they think that, for transfer to occur on its highest level, we must help students understand many widely useful relationships, principles, or generalizations; we must foster sensitivity to presence of opportunities for transfer so that likelihood of recognition is high; and we must encourage students to embrace goals, attitudes, and ideals which support the conviction that progressive refinement of outlooks on life is possible and commendable.

Gertrude Hendrix' new clue to transfer of training is that ". . . it is the intermediate flash of unverbalized awareness that actually counts for the transfer power. . . ."[53] She found that the way a person learns a generalization affects the probability of his recognition of an opportunity to use it. In method I (a conventional method) a generalization was first stated, then illustrated, then applied to new problems. In method II, the generalization was not stated, but "drawn out of" the learners by asking questions; teaching was for unverbalized awareness.

In teaching for unverbalized awareness the stage was set in such a way that as soon as the generalization dawned the learner would begin to apply it. Students were asked to find the sum of the first two odd numbers, the sum of the first three odd numbers, the sum of the first four odd numbers, etc. As soon as the subject knew the relationship between these sums and the number of odd numbers to be added, he started to gasp a little, or smile, or grew tense. That is, he showed in some way that something had happened to him. (The answer: the sum of the first n odd numbers is n^2.) Furthermore, he began to give succeeding answers rapidly, getting them by the learned short-cut method rather than by the laborious process of addition; by transfer behavior based on a generalization he revealed possession of the generalization.

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[53] Gertrude Hendrix, "A New Clue to Transfer of Training," *Elementary School Journal,* December, 1947, p. 200.

In method III, students were taught as in method II except that subjects were asked to state the rule they had discovered. Arrival at a correct verbalization (method III) took about twice as long as discovery of a generalization on an unverbalized level (method II). In every case included in two experiments, the highest transfer effects were achieved in the group taught by the unverbalized awareness procedure. The lowest transfer effects came from the group taught by the method in which the generalization was stated first, then illustrated, then applied to new problems. (What theory of transfer did this procedure represent?) Groups who learned by verbalizing the discovered generalization showed up somewhere between the other two groups. Hypotheses emerging from the data are as follows:

1. For generation of transfer power, the unverbalized awareness method of learning a generalization is better than a method in which an authoritative statement of the generalization comes first.
2. Verbalizing a generalization immediately after discovery does not increase transfer power.
3. Verbalizing a generalization immediately after discovery may actually decrease transfer power.[54]

The crucial points of Gestalt-field psychologists in regard to transfer of learning and its promotion now may be summarized in seven points:

1. Opportunity for transfer may occur in many situations. It is not inherent in any subject but is possible from any field of knowledge.
2. Transfer is not dependent upon exercise with disciplinary subjects.
3. Transfer is dependent upon methods of teaching and learning which use lifelike situations. It is facilitated by teaching for large generalizations which have transfer value.
4. Transfer is not automatic; opportunities for transfer must be recognized, and the person concerned must want to use them.
5. Transfer varies according to difficulty of generalization of subject matter and intellectual ability of individuals.
6. Insights need not be put into words for their transfer to occur.

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[54] *Ibid.*, p. 198.

7. The amount of intraproblem learning, not the number of trials as such, determines interproblem transfer.[55]

Chapter 11 extends our inquiry to consideration of the implications of the various outlooks on learning and transfer for methods of learning and teaching. But first let us peruse some common principles of learning that are generally accepted by adherents of the various "schools"; this is the subject of Chapter 10.

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[55] See Harry F. Harlow, "Learning Sets and Error Factor Theory," in Sigmund Koch, Ed., *Psychology: A Study of a Science,* McGraw-Hill, 1959, p. 502.

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CHAPTER 10

What principles of learning are commonly accepted by psychologists?

IN PREVIOUS CHAPTERS we have viewed several systematic theories of learning, and we have seen how much in contrast are the chief tenets of the two major families of contemporary learning theory. Now we review some principles of learning which are commonly accepted by modern psychologists, regardless of the schools of psychology with which they identify themselves.

This chapter focuses upon principles of learning which are not usually clearly attached either to S-R associationisms or to the Gestalt-field outlook. Thus, they are widely stated in textbooks of educational psychology, irrespective of the over-all orientation of the authors. Although the manner in which these principles are interpreted and used is influenced by whether one is an exponent of S-R associationism or of Gestalt-field psychology, in the main they lead to somewhat similar classroom results.

The principles presented in this chapter are close to classroom practice in the sense that they provide rather specific directives to teachers. In this respect, the present chapter is a bridge between the relatively abstract nature of preceding chapters on learning theory and the largely "how-to-do-it" emphasis of educational methods courses.

Before moving into an elaboration of these widely accepted principles of learning, we should make it clear that most psychologists, and particularly those with the widest reputations, are interested as much as ever in "system building," that is, constructing a body of theory which is cohesive and internally consistent and within which all elements, even minor ones, harmonize with the central premises. Examples of such persons on the side of field psychology are Donald K. Adams, Roger G. Barker, Ernest E. Bayles, Hadley Cantril, Dorwin Cartwright, Arthur W. Combs, Morton Deutsch, Fritz Heider, Maurice P. Hunt, Wolfgang Köhler, Ronald Lippitt, Gardner Murphy, Donald Snygg, and Herbert F. Wright. On the side of the associationists are W. K. Estes, A. I. Gates, Edwin R. Guthrie, Harry F. Harlow, Donald O. Hebb, Neal E. Miller, O. H. Mowrer, B. F. Skinner, and Kenneth W. Spence.

These persons, like prominent figures in all the other social and natural sciences, recognize that scientific progress has thrived on systematizations of thought, such as the theory of relativity in physics. But most scientists also recognize a different level of principle—what we might call "working principle" because of its immediate applicability in practice. The chief condition which a working principle must meet is that it not be inconsistent with the major system to which its practitioners are committed. However, it may be equally consistent with several competing systems.

The principles to be described have been selected from a wide range of literature. They are presented not as an all-inclusive listing of "working principles" of learning but as a sampling of some of the more useful, generalized statements which are supported by research and conclusions of reputable psychologists.

HOW MAY WE IMPROVE MOTIVATION FOR LEARNING?

When a person develops a state of tension resulting from unsatisfied need, we say that he is motivated. Motivation may spring from a variety of needs, ranging from those which are largely physiological in origin to those which are primarily psychological, such as a conflict in religious belief. A motive may appear as a generalized need for achievement or it may be specifically associated with a need to obtain a particular reward. The person's aim becomes the reduction of tension, which can occur only as the need is wholly or partially satisfied.

Obviously, motivation plays a central role in learning. Students who are motivated work purposefully and energetically. They display few if any "discipline" problems. Consequently, a teacher who can keep his students well-motivated has won more than half the battle.

Physical and Psychological Condition of Students

A first, although not necessarily the most important, step in motivation is to do everything possible to improve students' physical condition. Various studies have shown that improvements in health may lead to marked gains in IQ scores as well as in capacity and desire for steady intellectual growth. Of especial importance is the problem of faulty sensory equipment. The quality of motivation as well as perception is closely related to how well one's senses are functioning. A child with impaired vision or hearing may appear stupid; with the necessary correction, he may make startling gains in motivation and achievement.

Along with improvement of students' physical condition, teachers should do what they can to help children achieve adequate concepts of self. This may well be the most important recommendation we can make. To a large degree a person's goals and achievements are limited to what he thinks he can achieve. Virtually everyone eventually develops definite ideas about his limitations. It seems likely that, more often than not, people "sell themselves short." Parents or teachers often act as if they think children are lazy and dull. If this happens frequently enough, children come to accept this evaluation of their motivation and abilities.

The Role of Personal Involvement

Where possible, through the medium of a democratic classroom climate, a teacher's task is to help induce personal involvement. Personal involvement at its best is perplexity just short of frustration. Because of the interactive character of the most productive classroom situations, both students and teacher eventually should test their attitudes, values, beliefs, skills, and knowledge at the same bar of reflective examination. (Some specific techniques for doing this are described in Chapter 11.)

We would be unrealistic if we failed to concede that such an accomplishment is easier to describe than to achieve in practice. In virtually every school subject, a few students will appear well-motivated toward solution of real problems. A few others will appear to have no motivation toward learning and, in spite of a teacher's best efforts, will seem to remain that way. Another group, which usually contains a majority of the class members, will respond more or less well to the teacher's efforts to engender involvement and promote motivation. It is in working with this middle group that teachers feel their greatest sense of either accomplishment or frustration.

Intrinsic vs. Extrinsic Motivation

Intrinsic motivation is that tendency to activity which arises when the resolution of tension is to be found in mastering the learning task itself; the material learned provides its own reward. If a job is done because doing it is somehow satisfying, if the job carries its own reward; if it is done for its own sake, then we say that motivation is intrinsic. If Johnny washes his neck not because of outside pressures but because he likes the feel of a clean neck, or if he studies the construction of model airplanes diligently so that he can make his own model, he is experiencing intrinsic motivation.

Extrinsic motivation occurs when a person pursues a learning task, but for reasons which lie outside it. If a boy studies model airplanes because he thinks it will please his father, an ex-pilot, rather than because of a personal interest in model planes, he is moved by extrinsic motivation. When a learning goal is extrinsic, it is obvious that once the goal is met there ceases to be any point in remembering the learned material. If certain facts about a gasoline motor are learned only for the purpose of passing a test, as soon as the test is passed the reason for knowing the facts no longer exists. When motivation is wholly extrinsic, no matter how hard the study, we may expect that retention, understanding, and transfer will be much less than when material is learned for the sake of the learner.

After making the distinction between intrinsic and extrinsic motivation, it is necessary to point out that in most learning situations motivation cannot be categorized so neatly. It is a function of the total situation and hinges on some blend of personal concern for the work itself and some concern for extrinsic factors. As a practicable working principle, motivation is probably always a function of an interactive situation.

Obviously, both emphases on motivation *work,* in the sense that each leads to learning. However, since the material learned through extrinsic motivation does not in itself serve any purpose of the learner, educational psychologists condemn this type of motivation as undesirable because the learner tends to forget what he has learned as soon as his extrinsic purpose is met. Furthermore, in addition to poor retention of material learned, extrinsic motivation usually leads to careless, inaccurate learning. The learning task is hurried through as quickly as possible so that the reward may be obtained. If Johnny tries for a B in arithmetic because his father promises him a one-dollar reward, Johnny is not likely to care how he gets the B—copying someone else's answers is as good a way as any. This appears to represent the operation of Thorndike's law of effect. However, it is incompatible not only with the tenets of Gestalt-field psychology but also with what usually is recognized in the literature as the best of modern school practice.

In spite of the undesirability, on psychological grounds, of an emphasis on extrinsic motivation, in some situations many teachers feel they have no choice but to employ it. When this is the situation, teachers may be undecided as to whether to use rewards or punishments. A number of studies—in the Thorndike tradition—have been conducted in an attempt to determine whether it is more effective to praise students for what they learn or blame them for what they do not learn. After reviewing these studies, Stephens decides that the evidence is so conflicting that no definite conclusion can be drawn. The only conclusion which seems warranted is that either praise or blame is usually more effective in promoting learning than a policy of ignoring the achievement or lack of achievement of students.[1]

The Role of Success

Although occasional failure, including in some cases even punished failure, is not inimical to the progress of learning, fairly regular success is a must. As Pressey and his associates put it, "Learning feeds on success."[2] Unless motivation is extraordinarily high, a continuous succession of failures discourages students to the point where frustration blocks further effort.

However, too much can be made of the role of success. An uninterrupted series of successes may be as bad for the cause of learning as an uninterrupted series of failures. It is healthful to let students make a certain number of mistakes—provided they are the kinds of mistakes which contribute to their learning.

Related to the question of success *vs.* failure as a contributor to motivation is the question of whether students, at all times, should be kept informed of their progress. The answer seems to be that a knowledge of progress usually spurs students on to additional effort. However, this is not the case when the goals are too easy and students find themselves on the verge of success with much extra time and energy left.

Demotivation Caused by "Pat" Answers

We experience our strongest motivation in situations which are puzzling. If we completely solve the problem facing us, all sense of tension disappears; we cease to be interested because there is nothing to be interested in. Some misled teachers feel that each unit of work, or each class period, should end with a full resolution of whatever issue was under study. They sometimes feel that it is better for a teacher to tell students the "right answers" than to let them leave the class "unsatisfied." No policy could be more effectively calculated to destroy sustained motivation. A truly skilled teacher will see to it that each day students leave class with unanswered questions. Even an entire semester's work should not "wrap up" a subject "for keeps."

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[1] J. M. Stephens, *Educational Psychology,* Holt, Rinehart and Winston, 1956, p. 303.

[2] Sidney L. Pressey, Francis P. Robinson, and John E. Horrocks, *Psychology in Education,* 3rd ed., Harper & Row, 1959, pp. 355 ff.

Tests as Sources of Motivation

Some teachers feel that in order to keep students working it is necessary to give them frequent tests, both announced and unannounced. We are talking here of tests used for purposes of motivation, not for remedial purposes. Stephens surveys a number of relevant studies and draws a different conclusion.[3] At the college level, the research evidence suggests that tests given once or twice a term produce just as much motivation as frequent tests. In high school the results differ, in that tests spaced about two weeks apart seem efficacious. *Daily tests produce less motivation than no tests at all.* Furthermore, studies indicate that students learn less in courses in which they are given surprise tests than in courses where test dates and coverage are announced ahead of time.

Of course, tests employed as motivating devices function primarily as extrinsic motivators. A student's primary goal in such a situation is not to learn the subject content for its own sake but to pass the test. Generally speaking, frequent and widespread use of tests for other than remedial reasons indicates commitment to either a mechanistic or a disciplinary psychology.

Self-Imposed Goals vs. Teacher-Imposed Goals

It is a well-known fact among psychologists that when a person develops goals which he sees as personal to himself, although perhaps involving others whom he cares about, he tends to set ambitious goals. The tendency actually is for most students to set goals that are difficult to the point of being unrealistic—students who have great difficulty with mathematics sometimes choose engineering as their career.

In most school subjects it is not feasible for students to operate as completely free agents in setting their goals in the course. Although an experienced teacher has a pretty good idea of what an average student can and will achieve, it makes for better motivation to discuss the objectives of the course with students. Through such discussion, students and teacher both may come to feel more personal involvement in the course objectives.

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[3] Stephens, *op. cit.,* pp. 300–301.

HOW MAY WE MAKE LEARNING MORE EFFICIENT?

Improving the efficiency of learning means establishing situations in which maximum change of insight or behavior may occur in a given time. In the learning process, active participation of learners is highly advantageous over passive reception. Effective, active participation is promoted through observance of some rather specific principles.

Readiness and Learning

A young person is ready to learn something when he has achieved sufficient physiological maturation and experiential background that he not only can but also wants to learn it. For example, it is physiologically impossible for a child of three months to learn to walk. Furthermore, for all except an occasional prodigy, it appears impossible for a child of two to learn to read; not only is his neuromuscular system insufficiently developed, but he doesn't want to read. A youth of 12 normally is not ready to study subjects such as calculus, advanced economic theory, or Shakespeare. His lack of readiness probably is more attributable to absence of suitable experiential background than to inadequate development of physiological structures. However, until a person is fully matured physically it is usually difficult to say to what extent incomplete development of physical structure is a hampering agent, particularly in the case of primarily "intellectual" learning tasks. There is evidence to suggest that certain school subjects can be taught successfully much earlier than was once supposed—algebra is a case in point.

Much of the research on readiness has pertained to the teaching of reading and arithmetic. When is a youngster old enough to learn to read or to do long division? Although specific figures are frequently given (for example, a child often is said to be ready to read at the age of 6.5 years), they can be highly misleading. There is great individual variation among children. Some are ready to read at the age of three; others might as well wait until they are eight.

Serious problems may result from taking data on readiness literally, particularly when virtually all formal education in most countries is *mass* education. It is a matter of administrative convenience to require all children to begin school at about the same age. If Mary, who is ready to read at three, has been taught by her parents to read, and is reading at, say, a fourth-grade level when she enters the first grade, she is bound to find the school's reading program insufferably dull. She may become a highly bored and frustrated child and consequently frustrate teachers and parents. If Johnny is incapable of learning to read at six and a half, when we normally begin reading in this country, he may face a year or two of failure and eventually develop a mind-set against reading which will make it difficult for him to learn to read at any age.

Similar problems occur at all age levels. Some persons are never ready for certain learning tasks which are assigned regularly in school. For example, a person might be required to take a succession of physical education activity courses while in high school or college for which he may *never* be ready. A combination of poor coordination, poor vision, lack of previous experience, and negative mind-set could make it impossible for him to achieve, even at the minimum standards set by the instructors.

In considering readiness for learning, it is impossible to isolate those factors which are innate from those which are a product of learning. We can only assume that when a person is ready for a new learning, it is because he has developed his ability and interest to the point that he sees the new learning as the next step for him to make.

We do not even have conclusive data on the possible degree to which strong motivation may speed physiological maturation and readiness. An average youngster may achieve the necessary coordination to perform a particular physical task at the age of 12. But those who are especially interested in learning the task, and thus begin trying it at an earlier age, may significantly accelerate the development of the necessary coordination so that they are able to perform the task at the age of ten.

Studies indicate that there is nothing to be gained by starting youngsters on a particular learning task earlier than readiness normally permits. Regardless of whether readiness for a particular task hinges primarily on genetically controlled maturation or primarily on experience and desire, most children, if started at a task much earlier than it is normally learned in our culture, do not learn it well, if at all. They tend to flounder, making gains which are offset by retrogressions. The one who is started on the same task at the optimum time may learn so much more rapidly that he quickly catches up with the child started earlier.[4] This apparent fact should not be taken as a denial of the point made earlier: a number of subjects now normally reserved to high school or college could be taught effectively in elementary school if there were good social reasons for doing so. We have mentioned certain aspects of higher mathematics in this connection; foreign language is another example. There are social reasons, however, for keeping the elementary curriculum sufficiently uncluttered to be able to focus on fundamental language and arithmetic skills.

The Role of Practice

Although some learning is of an "Aha!" character—that is, the learner gets the point in a flash and does not forget it—other learning requires lengthy practice. If a teacher is to help students make the most efficient use of practice he must remember several important principles concerning its use.

First, repetition *per se*—doing exactly the same thing over and over again—does not teach. Thorndike's original "law of exercise" suggested that animals, and humans, learn an act merely by repeating it enough times. But in the 1930s Thorndike himself decided that such a notion had no experimental support and retracted his earlier statement. When we use the term *practice,* we refer to trials which have an experimental character; that is, trials in which the action is varied, even though slightly, and each time the learner asks himself either verbally or nonverbally, "What does it feel like?"

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[4] A number of such studies are summarized in Glenn M. Blair, R. Stewart Jones, and Ray H. Simpson, *Educational Psychology,* Macmillan, 1954, pp. 114–122.

"What did I do wrong?" or "How can I do it better?" Pressey, Robinson, and Horrocks cite a study in which the conclusion was drawn that ". . . repetition that occurs in acquiring skill is not repetition of one set of identical elements, but the gradual development of structural features. Instead of doing the same thing over and over, the learner progresses to more advanced stages of performance."[5]

Old-fashioned teachers who kept Johnny after school until he could write 100 times on the blackboard, "It is wrong for boys to spill ink on little girls' hair," undoubtedly taught Johnny something, but assuredly not that it is wrong to spill ink on little girls' hair.

Practice may be massed or distributed. *Massed* practice means long practice periods. *Distributed* practice means a succession of shorter practice periods with rest or other forms of activity spaced between.[6] Virtually all of the research evidence seems to show that spaced is more efficacious than massed practice. With massed practice both fatigue and boredom reduce attention and tend to cause practice to deteriorate into mere repetition.

In many instances, spacing actually speeds up the learning process. It is fairly common for persons to reach a plateau—a dead end—in learning, and to re-establish progress only after a waiting period. A certain person learned to swim "wrong." He never mastered the popular crawl stroke. He began learning this stroke in his 40s but was handicapped by poor coordination—he inhaled when his face was under water and exhaled when it was out. After a summer of near drownings and a winter's rest, the following June he again attempted the crawl stroke. Surprisingly, in the first trial he did much better. Although gains were slow that summer, the following year, after another winter's rest, he did better still.

One qualification needs to be made in connection with distributed practice as well as distributed study of any sort. Too much has been written about attention span. Some writers state with great specificity, in terms of number of minutes, the attention span of a person of a given age. Attention span refers to the length of time which a person can pursue a learning task without having his attention falter seriously. It obviously is a function of the level of motivation, and it is misleading to say, as some psychologists have, that the attention span of children increases with age. *It increases with motivation.*

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[5] Pressey, Robinson, and Horrocks, *op. cit.,* p. 349.

[6] Cronbach's chapter on practice does a good job of summarizing and restating some of the more significant research concerning practice. See Lee J. Cronbach, *Educational Psychology,* 2nd ed., Harcourt, Brace & World, 1963, chap. 9. Spacing is treated on pp. 295–296.

We have seen small children work as persistently and diligently at a task as any adult would be likely to do. The difference between childhood and adulthood appears to be that adults are better able to subordinate short-run pleasures in the interest of longer-range ones; adults find it easier to "live for the future." Hence, they can more easily develop long-range motivation for a short-range learning task which requires massed practice over an extended period of time.

Provided sufficient motivation is present, physical fatigue does not interfere seriously with learning. However, this statement is true only within limits; exhaustion can become so intense that even the highest level of motivation flags. Conversely, in the absence of motivation, a rather simple learning task can produce marked feelings of boredom.

Part vs. Whole Learning

The issue of part *vs.* whole learning dates back to the 1920s, when connectionism was first being challenged by the Gestalt outlook. The standard connectionist approach had been "piecemeal" learning: one begins with individual elements and learns them one by one, eventually assembling them into a whole. It would be wrong to suggest that the connectionists originated an atomistic approach to teaching; such an approach dates back much farther than Thorndike. However, associationist thinking in psychology did provide a "scientific" rationale for the atomistic approach by giving it theoretical support.

The Gestaltists insisted that we learn best when we begin with the largest unit we can comprehend. In studying a poem, for example, instead of beginning with a word-by-word or line-by-line analysis, students should read the entire poem rather quickly and try to size up its over-all meaning. Once this is done, a Gestaltist would have no objection to an analytical approach; when a person has gained some "feel" for the entire poem, analysis plays a different role: each part is studied with respect to how it fits into the total picture or configuration.

The part *vs.* whole issue has plagued teachers of reading for almost half a century. Should a child learn to read by learning first the alphabet, then how to pronounce syllables, then words, then finally sentences, paragraphs, and themes? Or should he begin with simple themes and strive as rapidly as possible to envision word groups and later entire sentences or paragraphs as units? Under the latter approach (sight reading) students get a feel for pattern and, so the argument runs, learn to read more rapidly and fluently.

As Pressey points out, the experimental evidence to date does not favor conclusively either one view or the other.[7] Most educational psychologists today, even those with an associationist orientation, argue in favor of the "whole" method for all types of material susceptible to such an approach. Yet, as Pressey indicates, the relative superiority of one method over the other may hinge largely on ". . . the learner's motivation, his patience, and the extent to which he perceives the learning situation as being important and fulfilling a need."[8] Pressey also suggests that intellectual capacity is a significant factor, in that persons with higher than average IQs tend to learn better by wholes. The amount and quality of prior practice also enters the picture; practice in either approach seems to increase one's efficiency in utilizing that approach. Finally, some learning materials lend themselves better to part learning, some to whole learning.

People who begin a learning task by the "part method" tend at some point in its achievement to advance to the "whole method." When this transition is made, progress is likely to accelerate rapidly. A good example of this learning process is the mastery of typing. The traditional way of teaching typing was first to teach students the location of the letters on the keyboard and how to stroke each letter at will. The next step was to teach them to type syllables. Next came words, then phrases, then sentences. This was the "part method" with a vengeance. Students can learn to type this way. However, they usually hit a plateau, a period of no progress in spite of diligent practice. Rather suddenly—often it comes with a rush in a matter of a few days—a student finds that he is no longer "spelling out" words on the typewriter. In fact, he is typing entire phrases or sentences without attention to individual letters or words. He has moved to "pattern typing." He has suddenly gained a feel for a stroking pattern appropriate to phrases, sentences, or groups of sentences. Now typing speed and accuracy tend to soar.

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[7] Pressey, Robinson, and Horrocks, *op. cit.,* pp. 353–355.

[8] *Ibid.,* p. 354.

When a typist can no longer recall where individual letters are on the keyboard he has moved to a fundamentally different approach and apparently the only one whereby a high level of skill can be achieved.

HOW MAY WE IMPROVE RETENTION?

Most of the studies of retention have been made by connectionists and have been based on a learner's ability to reproduce at some later date a response which he could once make. Studies of recall have included both sensorimotor and verbal responses. Pressey has summed up a number of studies of the recall of verbal responses—the so-called "fact learning" which is so commonly emphasized in schools. He concludes that "At the end of a course, students remember about three-fourths of the facts covered. One year following the conclusion of a course, students remember about one-half the facts covered. Two years following the conclusion of a course, students remember about one-fourth the facts covered."[9] These studies do not take us beyond two years after the learning occurred. There is every reason to suppose that the process of forgetting continues until, for most types of "fact courses," virtually all is lost. There is no research as yet which furnishes a basis for contradicting the opinion that many school courses might as well not be taken at all if their value is to be judged from any long-range results which we can measure. On the hopeful side, we know with little question that learning can be quite permanent; formal education is not necessarily doomed forever to be largely wasted.

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[9] *Ibid.*, pp. 262–263.

Meaning and Retention

Material which is meaningful to students is remembered much better than material which is not. Meaningfulness consists of *relations* between facts—generalizations, rules, principles—for which students see some use. Solitary facts essentially are on the same level of meaninglessness as nonsense syllables, and approximately the same forgetting curves apply to both.

Making learning meaningful is a matter of selecting the right content—knowledge reducible to principles—and helping students see its applicability in situations which they are concerned about. However, as McDonald points out, the mere learning of *any kind* of organizing principle, in itself, contributes to retention of learned materials.[10]

The positive results of meaningful learning are quite apparent. Cronbach cites a study in which tests requiring the application of major generalizations to new problems were administered at the beginning of a course in zoology, at the end, and a year later. The respective scores were 35, 65, and 65. There was *no loss* of material learned. In another study, where zoology students were asked to draw conclusions, infer principles, from experiments not previously studied, the respective scores were 30, 57, and 64. Students did even better after an interval of a year![11]

Stephens sums up the situation very nicely when he says, "If the material is sufficiently meaningful, there may be no forgetting whatever. An important governing principle, like the idea of the conservation of energy, may so help us organize the rest of our ideas that it stays with us for life. Content that is not so brilliantly structured but which still has much meaning will be remembered in proportion to its meaning. Nonsense material is headed for extinction before the last syllable is uttered."[12]

[10] Frederick J. McDonald, *Educational Psychology,* Wadsworth, 1959, p. 192.

[11] Cronbach, *op. cit.,* p. 352.

[12] Stephens, *op. cit.,* pp. 427–428.

Possibly the whole point is that material which can be learned insightfully, particularly on the level of generalized insight, becomes a permanent part of one's personality structure. All school learning *could* be of this nature if teachers understood well enough the basic psychological principles involved.

Purpose in Remembering and Forgetting

Any rounded study of retention would need to include study of the extent to which our wishes govern memory. It is pleasant to be able to forget some things. We do not automatically remember effects of new experience according to the length or spacing of practice sessions or other mechanical formulas. Rather, we do a reasonably good job of remembering what we really want to remember and forgetting what we prefer to forget.

One professor we know makes no attempt to remember his automobile license number. "I have no reason to," he says, "because I have the number on a tag attached to my key chain. It is easier to refer to the tag than to try to keep the number in mind."

Some experiences are so painful that our mental health benefits by our either forgetting them or restructuring them in memory so that what we recall in regard to them does not resemble closely what actually happened. On the other hand, some experiences are so pleasurable that we not only remember them in detail but even embellish them in our memory. The fish we caught on our Canadian trip of 1951 become larger and more numerous every year.

With respect to learning in school, where controversial content is concerned, we tend to forget that with which we do not agree and to remember that with which we do. A frequently cited study was conducted by J. M. Levine and Gardner Murphy, in the early 1940s. Students were grouped according to whether they were procommunist or anticommunist in attitude (at that time a student safely could be procommunist). Both groups of students were given pro- and anticommunist reading references. In a later memory check, the anticommunist students remembered the anticommunist arguments much better than they did the procommunist ones, and vice versa.[13]

[13] See McDonald, *op. cit.*, pp. 201–202.

Purposive forgetting and remembering are examples of psychological homeostasis. Through these processes we preserve our self-organization in a reasonably adequate state. Thus, we employ forgetting and remembering to heal psychological wounds, to shore up self-respect, and to make better sense generally out of our psychological world.

The final point of the foregoing sentence perhaps deserves a little elaboration. In Chapter 3 we discuss the Gestalt "law of Prägnanz" and related laws—all having to do with perception. It will be recalled that, according to these principles, when a person perceives fragmentary, incomplete, or asymmetrical objects he tends to see them as more complete, perfect, and balanced than they actually are. Probably every time we recall an experience we have a somewhat different perception, in the sense that we reinterpret what we recall in the interest of making a more pleasant pattern of it. Virtually all texts in educational psychology cite experimental evidence to support this view. One of the better treatments is contained in the text by Frederick J. McDonald.[14] Perhaps the main lesson to be had from these research results is that forgetting is an active and not a passive process, just as is any learning which has promise of retention.

The Role of Overlearning

A person can learn something well enough to make a perfect score on a test given immediately after the learning; he can then continue practice on the same material for an indefinite time, or at least until boredom poses an insurmountable barrier. It has been found that such overlearning does contribute to retention. Hence most books in educational psychology list overlearning as a means of improving retention. It should be noted, however, that, when the material to be learned is sufficiently meaningful, overlearning is unnecessary. Overlearning is a counterpart to attempts to teach relatively meaningless content.

Nevertheless, when a person is faced with a learning task such as acquiring the vocabulary of a foreign language, overlearning may be the sensible course to pursue. Overlearning is measured in terms of the percentage of additional practice spent after initial mastery. According to one study, reported by Stephens,[15] 50 percent of overlearning produced a gain in retention after an elapsed time of 28 days of approximately 25 percent; 100 percent of overlearning contributed only slightly more gain than this, possibly because boredom interfered with its effectiveness. Other studies do not produce the same percentages, but all seem to agree that overlearning contributes to retention.

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[14] See McDonald, *op. cit.*, pp. 188–191.

Spaced Review vs. Cramming

Apparently retention is higher when study periods are spaced methodically over the course of an entire semester than when a student waits until a day or two before the final examination and "burns the midnight oil." However, results on a final examination may be equally good with either study procedure; some students learn to cram quite effectively. Nevertheless, long-range results from cramming are likely to be meager.

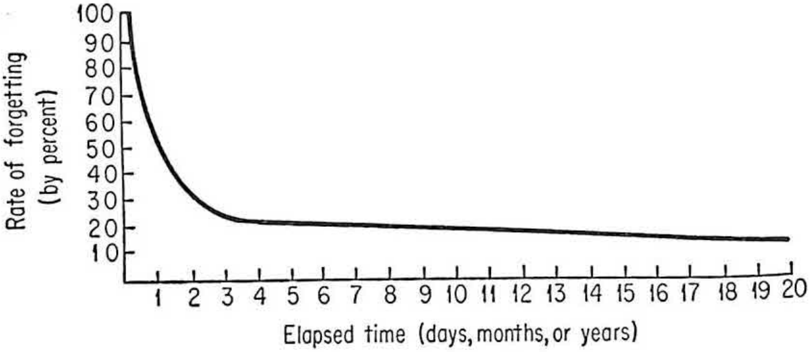

FIGURE 10.1 *A Typical Forgetting Curve.*

The issue of spaced review *vs.* cramming is: In what temporal relationship to the initial learning should review occur; should it be distributed or massed? The answer seems to be suggested by the nature of a typical forgetting curve, as shown in Figure 10.1. Since the rate of forgetting is much more rapid relatively soon after the initial learning, we may hypothesize that review periods should follow immediately after the initial learning and not be delayed. McDonald cites experimental evidence to suggest that spaced but frequent reviews immediately following initial learning, followed by widely spaced "brush-ups" during the period of desired retention, represent the most effective approach.[16]

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[15] *Ibid.*, p. 429.

Readers should remember that when we say "review" we are not referring to repetition; rather, we mean practice with an experimental cast, as described earlier. If the reviewer seeks to go beyond the initial learning by tying it in with new learning or interpreting it on a more sophisticated level, review is even more effective. Readers also should remember that the forgetting curve reproduced in Figure 10.1 and the present discussion of the role of practice in improving attention apply primarily to either complicated sensorimotor learning or verbal learning which is relatively low in meaningfulness and intrinsic motivation. Learning of the most desirable kind produces a rather flat forgetting curve and does not need to be practiced in order to be remembered.

Effects of Intervening Events

A great deal of writing is available on the general subject of how newly learned items of knowledge interfere with the recall of previous learnings and, conversely, how items previously learned interfere with the recall of those most recently learned. When a second set of learnings intrudes upon a first set, and prevents or distorts the recall of the first set, we say that *retroactive inhibition* has occurred. When a first set of learnings intrudes upon a second set, and prevents or distorts the recall of the second set, we say that *proactive inhibition* has occurred. Since there is a strong tendency for any two sets of related learnings to influence each other negatively as well as positively, some writers prefer not to make the above distinction, but rather to use the term *interactive inhibition* to describe any negative transfer effect of intervening events.[17]

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[16] McDonald, *op. cit.*, p. 197.

[17] See, for example, Arden M. Frandsen, *Educational Psychology*, McGraw-Hill, 1961, pp. 372 ff.

Students who read the present book frequently report that, by the time they have completed the first three chapters, so many different points of view about key issues in psychology have been presented that they "can't remember any of it." They then go on to say that they could remember well enough through the first three or four positions, but after that, with the addition of still others, they "can't remember the first ones." This would seem to be a clear example of interactive inhibition. (Fortunately, several years of experience using the manuscript of this book prior to publication demonstrated that most students could learn, by the end of the semester, to recall all of the major positions treated and to distinguish them sharply from one another. This suggests that sometimes a suitable antidote for interactive inhibition is simply more study.)

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CHAPTER 11

How is learning related to teaching?

IN THE EARLIER CHAPTERS of the book we have considered various learning theories which teachers might adopt. Now, we should be ready to examine how the respective theories are related to teaching principles and procedures. However, a necessary preface to inquiry into the relationship of learning theory to teaching practice is an examination of the unique role of teachers in our culture.

WHAT IS THE ROLE OF TEACHERS IN MODERN AMERICA?

When we consider the role of teachers in modern America we should study both of its aspects—teachers' relationship to the culture, and their relationship to their students. By *culture* we mean the established way of life or social heritage of a people. It is constituted of all those socially transmitted results of human experience through which a group of people carries on its way of life. It includes language, customs, morals, tools, institutions, knowledge, ideals, and standards.

What Are the Possible Relationships of Teachers to the Culture?

Probably most persons would agree that one of the chief functions of teaching is to preserve, by transmitting to the young, that part of the culture regarded by most people as good. However, this task by itself makes education a highly conservative force. Teaching which does no more than conserve a culture is appropriate to a static, but not to a dynamic, rapidly changing culture such as ours. Hence teaching, in a fast-moving culture, must operate in relation to change so as to keep cultural innovations socially beneficial. Although support for this two-fold function of teaching probably would be unanimous, it would be difficult to get agreement on just how the two tasks of cultural conservation and cultural improvement are to be performed simultaneously.

Controversy concerning the cultural role of schools centers around the extent of their obligation to their culture. Obviously, schools are not the only agents which transmit culture and effect cultural change. Homes, churches, the mass media, and numerous social organizations also participate in this function. Nevertheless, the task of schools in regard to their culture appears to be growing —and for the reason that our way of life is changing markedly.

Teachers in early American schools felt that they had fulfilled their obligation when they had done a good job of drilling students in the three R's. It was left to the community outside the school to teach children and youth what they needed to know about the practical affairs of everyday living. In a society characterized by agriculture and handicraft industry, much of the nation's economic production was conducted by family units. Children worked alongside parents on farms, in homes, or in shops. Thus, transmission to the young of not only vocational and homemaking skills but also the common attitudes and values of the culture was a simple, informal process.

It would be difficult to overemphasize the function of small communities in the informal, out-of-school education of early America. A century ago most people lived in rural communities—either on farms, in villages, or in small towns. The people had a face-to-face relationship with each other. Consequently, they enjoyed what sociologists call a "sense of community." That is, they experienced a close and intimate kind of interaction; they were psychologically near one another. Everyone knew what almost everyone else thought about most matters, and thoughts and actions of most people followed the patterns dictated by local customs and moral beliefs. In such a society, young persons were easily induced to adopt the thought patterns of adults. Consequently, moral, social, and political education could be left to agencies other than schools.

Modern technology has led to disintegration of the older sense of community. Communities now exist only as physical entities. The older psychological bonds between people largely have dropped away. Henry Ford thought that his Model T would enable community members to gather together more readily and thus it would strengthen the sense of community. But Ford and numerous other technological pioneers did their jobs too well. The Model T and other agencies of communication and transportation led people to look and move outward. The Model Ts went right through small communities to big impersonal cities, and the communities were doomed.

Today, opportunities for children to learn from parents and the community are greatly reduced. True, contemporary culture provides vast informal opportunities for learning. The regular viewing of television provides an education, albeit not exactly the kind most teachers and parents wish. The welter of facts and ideas coming at a young person is enormous in quantity. Nevertheless, knowledge, informally gained, contains gaps, unbalanced emphases, and contradictions. Values learned often are not those which adults want children and youth to adopt. Furthermore, the content of what is learned is unintegrated to the point that young people can hardly escape feeling confused and more or less helpless.

Schools today are expected to perform not only the function of the schools of a century ago but also a multitude of other tasks growing from the fact that much parental and community teaching which once was operative no longer functions. Not only are today's schools expected to teach many matters which now are taught only by schools—such as many vocational skills—but they also are expected to help young people evaluate and make sense of the precepts and information presented them by the mass media and other cultural agencies of instruction.

There are three different, basic attitudes which a teacher may take in regard to his function in preserving and improving the culture. He may envision himself as (1) a cultural architect, (2) a conservator of the culture, or (3) a democratic leader in amending the culture (to amend a culture is to modify it in any way for the better). Let us explore each of these attitudes briefly.

A TEACHER AS A CULTURAL ARCHITECT. A teacher who adopts this view sees himself as an innovator. In his thinking he designs the specifications of an ideal culture. He then teaches the attitudes, values, and knowledge which will cause new generations to move in the direction of his ideal. He is likely to push ideas toward which resistance will develop and is not reluctant to indoctrinate and propagandize in order to achieve his purpose. Since a teacher who sees himself as a cultural architect is discontented with affairs as they are and wants to introduce a new cultural design, his point of view has been called "social reconstructionism."

A TEACHER AS A CONSERVATOR OF THE CULTURE. A teacher who accepts this role sees himself as preserver of traditional attitudes, values, beliefs, and knowledge. To the best of his ability he discovers what *now is* and attempts to transmit this, intact, to new generations. He recognizes that accidents of history will induce cultural changes, and that if these changes contribute to the welfare of people they will be perpetuated. However, he never sees himself as an active agent of cultural change. Teachers in this framework are conservatives. Since unorthodoxy bothers conservatives, they are likely to try to suppress any unconventional thinking on the part of students. In a manner much like that of a social reconstructionist, who also has specific objectives in mind, a conservative teacher often indoctrinates his students and propagandizes his objectives into their thinking and behavior.

But, however much teachers may be dedicated to it, the role of conservator of a culture is probably impossible to perform. With the loss of the old sense of community and the accompanying decay of the cohesive and relatively consistent value pattern which accompanied it, there no longer is a harmonious structure of attitudes, values, and beliefs to promote. Confronted with a culture filled with confusion and contradictions, which elements is a conservative teacher to select and teach? Is it not reasonable that teaching today should help students examine as objectively as possible their disjointed culture in the hope that as they live their lives they will be able to work some integration into it? But this is a job for neither an impetuous seeker of change nor a conservative who is frightened of change.

A TEACHER AS A DEMOCRATIC LEADER IN AMENDING THE CULTURE. In contrast with adherents to the two extreme—reconstructionist and conservative—positions, a teacher may visualize himself as functioning much as a head scientist in a laboratory does. Although the subject matter under investigation is the culture, the primary purpose of investigation is neither to change nor to preserve it, but to appraise and strengthen its tenability. Accordingly, an attempt is made to uncover contradictions and conflicts in a culture and to determine possible ways of resolving them, or at least preventing them from causing serious trouble. The ultimate hope of a democratic teacher is that the culture will be progressively refined by a citizenry which has learned the habit of studying problems in a reflective and democratic manner. This kind of teacher fosters social change, but helps to keep it orderly and constructive. A teacher, as a democratic leader, does not discard all his personal preferences. Like either a social reconstructionist or a conservator of culture, he too holds certain ideas in preference to others. However, his method of teaching, unlike that of either a social reconstructionist or a conservator of culture, is the method of democracy. In a very real sense, he and his students are building culture together.

A teacher who functions as a democratic leader believes that, since man is a cultural animal, there need not be assumed any ceiling or limit to the possibilities of human nature. When human nature is neither assumed to be tied to a natural unfoldment process nor to be static or inert, it encompasses all the institutional achievements of dynamic society. With sufficient application of human intelligence, a society can continue growth in the direction of more adequate and harmonious living for all individuals involved. If teachers are to aid substantially in cultural progress, they must encourage students to study the culture of their own and other societies, but always with a view toward progressive refinement of those cultures.

What Are the Possible Relationships of Teachers to Their Students?

We may visualize three broad types of relationships between a teacher and his students: (1) authoritarian, (2) laissez-faire, and (3) democratic. Each form of relationship produces a distinctive type of situation within a classroom, characterized by more or less predictable results and carrying with it definite implications concerning the teacher's commitment in regard to how he thinks students learn. Furthermore, a particular type of relation of a teacher to his students presupposes a respective relationship to the culture. Whereas an authoritarian teacher considers himself either a cultural architect or conservator, a democratic one sees his cultural role as that of a leader in the culture's amendment. A laissez-faire teacher views the culture as a necessary evil, outside nature, which should be ignored or neutralized as far as possible.

AN AUTHORITARIAN TEACHER. An authoritarian teacher exercises firm, centralized control. He closely directs every action of his students. He does all the planning for the class and issues all the directions. Furthermore, he tells students what to think as well as what to do. In an authoritarian classroom, a teacher regards himself as the sole active agent and considers students passive receivers of instructions and information. Consequently, an authoritarian teacher is most likely to adhere to a mental disciplinary, apperceptive, or S-R associationistic theory of learning.

In the experiments with group climates conducted by Lippitt and White, it was found that boys in authoritarian groups tended to be apathetic and dependent and to demonstrate little capacity for initiating group action. When the leader left the room, they accomplished very little. Although they did not seem to resent authoritarian leadership strongly, they occasionally showed evidences of hostility, as expressed in aggressive acts toward fellow group members.[1]

A LAISSEZ-FAIRE TEACHER. A laissez-faire teacher goes to the opposite extreme. Since, by his actions, he commits himself to a psychology of natural unfoldment, he does not really lead at all.

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[1] See Ralph K. White and Ronald Lippitt, *Autocracy and Democracy, An Experimental Inquiry*, Harper & Row, 1960.

He is present, he may answer questions, but essentially he leaves students "on their own." Students decide what they want to do and how they will do it.

In the Lippitt-White experiments, boys in the laissez-faire group got along together much better than those in the authoritarian group; they showed less tendency to direct resentments at fellow students. They did get some work done. However, they acted insecure; for example, they repeatedly asked for help and, after the experiment was completed, expressed dissatisfaction with its leadership.

A DEMOCRATIC TEACHER. In a democratic teaching-learning situation the teacher plays the role of a democratic group leader. His chief purpose is to lead his students in the study of significant problems in the area in which he is teaching. Such study presupposes interchange of evidence and insights, give-and-take, and respect for one another's ideas. In a democratic classroom the teacher's ideas are subject to criticism just as are those of students. Although the teacher may be an authority on his subject, and to teach best should be, the situation is arranged so that students are encouraged to think for themselves.

A democratic teacher, if his psychological approach harmonizes with his relationship with his students, is most likely to use a cognitive-field psychology of learning or some kindred outlook which also emphasizes purposiveness in human experience and behavior.

In the Lippitt-White experiments, democratic groups evidenced a more friendly and confiding atmosphere than did authoritarian groups. Members seemed as able to extend mutual recognition to each other as did members of the laissez-faire groups. However, they worked on a higher level of efficiency and were much less dependent on the leader than were the laissez-faire groups. Furthermore, they also showed more initiative and worked much more effectively in the absence of a leader than did the authoritarian groups.

There seem to be good reasons why consistently democratic relations should be substituted for both autocratic and laissez-faire modes of operation. It ill behooves a nation which is straining in democratic directions to maintain nondemocratic relationships between teachers and students. Furthermore, evidence now available indicates that students learn more effectively in a democratic than in either an authoritarian or a laissez-faire classroom.[2]

In many places, the idea of a democratic school has fallen into ill repute during the past 20 years. There are two basic, but unfortunate, reasons for this: (1) *Laissez-faire situations often have been mistaken by the woolly-minded for democratic situations.* Truly democratic teachers, however, hold no brief whatsoever for laissez-faire classrooms, and feel that it is tragic for an educator to call an uncontrolled and undirected classroom "democratic." (2) *The terms democracy and democratic have been perverted.* To some, "democratic," as applied to teaching, has come to mean "easy," "soft," or "undisciplined." Yet the fact is that, making allowances for the maturity and capabilities of students, a democratic group may work at the maximum level which health permits, and its manner of operation may be fully as rigorous as that of any scientific investigation.

There is a close connection between the respective types of relationships of teachers and students and the relative amount of usage of each of three different levels of learning and teaching. These *levels* are the subject of the next section.

WHAT ARE THE LEVELS OF LEARNING AND TEACHING?

Teaching-learning situations may be classified according to where they fall on a continuum which ranges from "thoughtless" to "thoughtful" modes of operation. However, it is convenient to divide their total range into three broad classifications: memory-level, understanding-level, and reflection-level. Memory-level is most "thoughtless" and reflection-level most "thoughtful." Products of both the understanding- and the reflection-level are understandings or insights, but those of the reflection-level are understandings or insights *plus* increased ability of the learner to achieve further understandings or insights independently. Because of the nature of the process and products of reflection-level teaching and learning, this level harmonizes best with a teacher's or school's commitment to democratic—nonauthoritarian—teacher-student relationships.

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[2] See Ernest E. Bayles, *Democratic Educational Theory,* Harper & Row, 1960, chap. 1, "Experiments with Reflective Teaching," pp. 1–33.

What Is Memory-Level Learning and Teaching?

Memory-level learning is that kind of learning which supposedly embraces committing factual materials to memory and nothing else. We all know how this can be done; it is possible for a person to memorize virtually any type of material, including that which seems quite nonsensical. The more meaningful the material to be learned, the easier it is to memorize. Furthermore, the more meaningful the learned material, the longer it tends to be retained. A collection of "nonsense" syllables might conceivably be remembered for a lifetime if a person had sufficient reason for retaining it. However, when one develops a reason for retaining something, it is no longer nonsensical.

At first glance, rote-memory learning seems to exemplify a mental discipline or S-R associationistic theory of learning; either a substantive mind is trained or simple linkages are formed between stimuli and responses with no particular thought or purpose involved. But a cognitive-field psychologist denies that either is the case. Instead he insists that, if anything is learned at all, insight of a sort is always present. What characterizes rote learning, to a cognitive-field theorist, is that the insights acquired usually have no significant relationship to the material being studied. However, the learned material is *patterned* by the learner during the process of his learning it. Even "nonsense syllables," when learned, are not completely unpatterned.

Capacity to memorize and retain material probably bears no positive relationship to capacity for intelligent behavior. Geniuses are notoriously forgetful, although not usually in their areas of major interest. Conversely, a mentally defective person may be highly proficient in memorization. Polly was a 13-year-old girl with the mental capacity of an imbecile. She had a quite brilliant memory of the "shotgun" variety. That is, she memorized indiscriminately anything she heard, and often could repeat verbatim an overheard conversation or a radio newscast after hearing it once.

She could recite faultlessly the words of every popular song being broadcast at the time. Nevertheless, Polly's "thought power" was so impaired that, if asked to close an outside door of the house, she could not decide on which side of the door to stand to avoid shutting herself out.

Every experienced teacher can recall numerous students who developed a considerable capacity to memorize standard curricular materials in most or all school subjects. Such students usually make high marks. However, when placed in situations requiring reflection, they may be at a loss. If, occasionally, they take a course with a teacher who employs problem-centered teaching, they may become extremely frustrated and do very poor work. Conversely, an experienced teacher also can recall students whose marks were spotty but who achieved magnificently once they got out of school. There is a fairly good chance that in such cases poor achievement in school is a result of rebellion against required rote memorization.

Memory-level teaching may, of course, contribute indirectly to intelligent behavior. If memorized facts become pertinent on an occasion when a problem requires solution, they contribute to usable background and hence to the effectiveness of problem solving. However, memorized facts usually contribute little to effective student growth. One reason is that, as already suggested, they tend to be forgotten quickly. Another is that a large proportion of the facts memorized in school are irrelevant to future thought needs. In summarizing the value of rote memory teaching we might even say that the best way to make sure that a student will *not* remember many facts is to place the whole emphasis upon teaching him facts.

It no longer is a matter for speculation that not much in the way of durable or useful results can be expected from memory-level instruction. Its contribution to intelligent behavior is too unpredictable and undependable for us to set much store by it as a favored instructional procedure. Yet there is no reason to suppose that most teachers are dedicated to some other approach. No matter how much talk is raised against straight memory-level instruction, there are numerous pressures placed on teachers to confine teaching to this level. Furthermore, many teachers may have no vision of anything different.

In spite of all the legitimate criticisms we may make of rote memorization, it would be unrealistic to suppose that a teacher can always avoid it. In any ordinary school situation, on occasions even the most imaginative teacher will have no better approach than memory-level teaching. This may occur on days when lack of time has prevented planning anything else. Or it may happen when the teacher does not know how else to handle the material to be covered.

One might ask, Can the fundamental skills, such as spelling, be taught otherwise than through a process of straight memorization, using drill procedures? Generally speaking, they *can* be taught more efficiently through other procedures. However, much more study will be required to develop procedures for teaching all the fundamental skill subjects in ways which will free us entirely from rote memorization.

What Is Understanding-Level Learning and Teaching?

The term "understanding" has been used so ambiguously by psychologists and educators that teachers are likely to use it rather glibly, without being able to define it clearly. A teacher may ask his students, "Are you sure you understand this?" and himself not know the meaning of his question. One may be fairly sure his students do not know either.

The *American College Dictionary* includes the following definitions of the verb *understand:* "1. to perceive the meaning of; grasp the idea of; comprehend. 2. to be thoroughly familiar with; apprehend clearly the character or nature of. 3. to comprehend by knowing the meaning of the words employed, as a language. 4. to grasp clearly as a fact, or realize."

A serious student of educational psychology will be dissatisfied with definitions of this kind. Although helpful to a degree, they are not sufficiently operational. That is, they do not show what a person does—what psychological steps he takes—when he comes to understand something. In the sections to follow, we present two key definitions and then show how they may be combined into one.

UNDERSTANDING AS SEEING RELATIONSHIPS. This definition of understanding is implied in the first category of dictionary definitions. One meaning for *comprehend* is "to take in or embrace"; the Latin root is *comprehendere,* meaning "to seize." In other words, we have here the idea of reaching out and gathering in individual items. As they are pulled together, they are understood. However, the definition implies still more; it involves inclusion or embracement of a group of particulars under a single overarching idea. If this definition seems too abstruse, perhaps the following illustration will help.

John M. is a beginning teacher. He has had little experience working with children and none with a group as diverse as his sixth-grade class. He notices that some of his students steal and others seem scrupulously honest. Some come to school dirty and unkempt, others are always well washed and well groomed. Some speak ungrammatically, others consistently use "school-teachers' English." Some use "dirty language," while others seem to use only language which would be approved in a Sunday school class.

For a long time, these differences in students puzzle John. But as a result of back-to-school nights, occasional contacts in the community with parents, and information received from other teachers, he finds that the habits of his students are very much like those of their parents, or, if not that, like the prevailing pattern of behavior within the socioeconomic group to which the parents belong. John gradually begins to form some generalizations—general ideas—to explain the individual Marys and Jimmys in the class; he restructures his life space.

One of these generalizations is that "Much in the behavior of children can be explained by the nature of the social class in which they live." A number of corollary generalizations, of which the following three are illustrative, also are helpful: "Almost without exception, 'lower-class' children use 'rough' language." " 'Middle-class' children do not reveal as great an overt interest in sex as do 'lower-class' children." "On the average, 'middle-class' children get better marks than 'lower-class' children."

Note how John M. has changed the way in which he perceives his students. He has come to group or classify them in a more meaningful manner. He understands little Mary better because she is a member of a general classification: lower-middle class, Suburbia, U.S.A. There are other little Marys who exhibit the same habits and who can be placed in the same classification. Because of certain traits they have in common, John M. has grouped these students into a "class"; he has "pulled them together." As is illustrated in the foregoing paragraph, he sees each individual child in relation to appropriate generalizations.

Seeing solitary facts in relation to a general principle is the essence of understanding implied by our first definition of the term. Although we are about to suggest that there is significantly more to understanding, teaching probably would be more effective than it now is if all teachers grasped even this limited definition. Too few teachers realize that any item of factual knowledge is quite meaningless unless students see how it is embraced by a general principle. Every fact must be seen as either supporting or casting doubt upon some principle or it means nothing. Yet entire textbooks have been written which contain little more than "descriptive facts." Teachers often labor away a professional lifetime without trying to teach students the generalizations which would be necessary for them to "pull together" the facts they are required to memorize.

One reason why Herbart, in retrospect, appears such a significant figure for his time is that his instructional steps were designed to teach students how to move from individual facts to generalizations—principles—and to use these generalizations to interpret new facts. Herbart's insight concerning the crucial role of generalizations placed him far ahead of even many contemporary educators.

S-R associationistic psychology of learning, in actual practice, represents a combination of memory and understanding—as seeing relationships—levels of learning. Since this psychology centers upon behavior which is the result of forces exerted upon individuals, explanation for what persons do is sought in the circumstances which surround them, the pressures upon them, and the facts and principles they have learned. Consequently, a child or youth is something to be molded in the proper fashion; learning, primarily, is a process of amassing facts and principles; and teaching is a matter of setting objectives for students, and creating the proper environment to ensure their reaching these behavioral objectives. With these goals in mind, teachers are to transmit facts and principles—rote memories and understandings—to students through telling, showing, guiding, rewarding, punishing, and, at times, forcing and coercing them.

UNDERSTANDING AS SEEING THE TOOL-USE OF A FACT. Now, let us look at a second definition of understanding. We may say that a person understands something if he sees how that thing can be used to fulfill some goal. (*Thing* is used here in its broadest sense of "any existent"—any object, matter, process, idea, or fact.) As soon as a person sees what something is for, he understands it. Of course, the degree of one's understanding is always relative. If I know that a camera takes pictures, I have begun to understand a camera, but, if I am going to use a camera successfully, I need to know the details of its operation. I need to know the consequences of using different types of lenses, film emulsions, lighting, and picture compositions.

Note that according to this second definition, *purpose* is always involved in understanding. The understander must have a goal, and he must see that which he seeks to understand in relation to that goal; he must see how that which he is trying to understand can be made to help in achieving the goal, or how it can be kept from hindering such achievement. It is as important to understand things which get in our way as it is to understand those which help us along. A rattlesnake may be understood as something to be avoided, just as a good steak dinner may be understood as something to add savor to life.

This second definition of understanding harmonizes well with the cognitive-field outlook. According to this outlook, each individual, when behaving intelligently, is trying to "size up" his life space in terms of how its various functional regions—objects and activities—can be made to serve his purposes. The chief of these purposes is "maintenance and enhancement of a self," that is, progressive improvement of a person's ability to structure and use his psychological person and environment for his purposes.

It is from experimentation that understanding grows. One continuously experiments in that one tries first one course of action and then another, preserving only those which work. Thus, through experience, the features of each person's environment progressively develop a "pointing quality"—dark clouds "point" to rain, Johnny's outthrust jaw and angry squint "point" to a poke in the jaw for Freddy. This pointing quality which we give to features of our environment permits us to behave intelligently—we can act with foresight because there are all kinds of signposts along the way. The pointing quality of things tells us the consequences of using them, which is to say, how to use them with maximum effectiveness.

UNDERSTANDING AS SEEING BOTH RELATIONSHIPS AND TOOL-USE. It is important to realize that understanding as seeing the relation between particulars and generalizations and understanding as seeing the tool-use of things are not incompatible. Not only are they compatible; it would appear that, in order to have a fully adequate definition of understanding, we need to incorporate the latter meaning into the former.

Because it ignores the role of purpose, understanding as merely seeing relationships is not an adequate concept. Suppose one sees the relationship of certain specific facts to the principle of flotation, as we portray in the example of a Herbartian lesson plan in Chapter 2 (pp. 42–43). A student reaction to a forced acquaintance with such relationships might simply be, "So what?" and no attempt would be made to delve deeply into the implications of the principle, to remember it for future use, or to transfer it to new situations. In other words, understanding which confines itself to seeing relationships between particulars and a general is a fragile and superficial achievement. But suppose a student is a boat hobbyist. He builds boat models and operates them upon a local lake. He is involved in developing a design and needs to know how much of the boat will be submerged when it is carrying four persons whose average weight is 130 pounds. To this student the principle of flotation, and the concrete facts subsumed under it, will seem of vital importance.

What we may label "full understanding," "true understanding," or even better, "functional understanding," is much more likely to occur if a learner, in learning generalizations and the specific facts pertinent to them, sees how some purpose is served thereby. In effect, we cannot divorce the problem of teaching understanding from that of developing motivation. Thus, in the most adequate sense, *understanding occurs when we come to see how to use productively, in ways which we care about, a pattern of general ideas and supporting facts.*

In the literature of education, we regularly encounter the noun "understanding" or "understandings," as well as the verb "understand." The noun form refers to the *product* of acts of understanding. Other names for understandings are *general ideas, concepts, principles, rules, laws, generalizations,* and *theories.*

An understanding, then, is a generalized insight. Often it may be put into words, but not always. The understandings a person achieves about a golf swing, jumping the high hurdles, or casting a fly may lie, in part, in a "feel for the act" which would be difficult to verbalize. On the other hand, most persons who have thought about such achievements are able to make statements about the probable consequences of attempting them in alternate ways.

UNDERSTANDING-LEVEL TEACHING. Understanding-level teaching is teaching that seeks to acquaint students with the relationships between a generalization and the particulars—between principles and solitary facts—and which shows the uses to which the principles may be applied. When a teacher tries to teach students rules governing the use of, say, subjunctives, he is trying to keep his instruction on an understanding level. If he succeeds, his students will be able to identify cases in which a given rule applies and then use the rule as a guide. We are seeking the same kind of result when we teach rules of spelling, rules for dividing fractions, or rules for repairing a motor. We are likewise operating on the same level when we teach theories in physics, chemistry, or football. (A rule or principle, by definition, is a theoretical statement.)

A contrast may be drawn between understanding-level and memory-level teaching as follows: if understanding-level teaching is successful, students will know, in addition to facts, the principles by which the facts are related; memory-level teaching tends to ignore principles, or at best handles them on such a superficial level that they have little meaning.

From the standpoint of an educational psychologist, understanding-level is much to be preferred over memory-level teaching. In fact, few educational psychologists would settle for anything less.

They would argue that much of the inefficiency in education, which research has exposed, stems from the way most school subjects are organized and presented. Subjects often remain meaningless to students, not because of students' intellectual deficiencies, but because human mentalities work in such a way that the subjects, *as organized and taught,* have little meaning for them.

Understanding-level teaching gives students a tool for more intelligent behavior. It equips them with generalized insights which can be applied in problematic situations both in and outside school. It provides them with a mental kit of rules. If the rules learned are the best that are known at the time by people in a position to have expert knowledge, students have at least gained something from their education.

By this time readers may have sensed that there is still something lacking. Understanding-level teaching, if it remains merely that, casts the student as a passive and the teacher as an active agent. The teacher tells, the student listens or the teacher stimulates and the student responds. Understanding-level teaching may be highly uncritical and authoritarian. Furthermore, the principles taught by the teacher may be wrong—and sometimes are. Consequently, understanding-level teaching may lead to more intelligent behavior on the part of a student, but it does not carry with it the quality of experience needed to enhance intelligence to its fullest potential.

What Is Reflection-Level Learning and Teaching?

When a person reflects, he turns his thoughts back upon an idea or article of knowledge which supposedly exists. Thus, reflection-level learning is careful, critical examination of an idea or supposed article of knowledge in light of the testable evidence which supports it and the further conclusions toward which it points.

Reflection-level learning leads to understanding, but with reflection the search for understanding is pursued in a different fashion from that described in the preceding section. Instead of their being given a collection of facts and generalizations by a teacher, students are confronted with something which is problematic—either unclear or puzzling. Reflective learning may be based upon inadequacies or disharmonies of the mental furniture that a student brings with him to school—his own attitudes, beliefs, values, and knowledge. Or it may begin with some observed inadequacy—inconsistency, incompleteness, or irrelevance—in the subject matter. In any case, if reflective learning occurs, a problematic situation appears about which a student centers his thinking and research. In the reflective process, he examines facts and generalizations and seeks out new ones.

There are crucial differences between understanding- and reflection-level teaching. The latter requires, on the part of students, more active participation, more criticism of conventional thinking, and more imagination and creativeness. The classroom atmospheres associated with the two approaches differ markedly. Reflective teaching leads to the development of a classroom atmosphere which is more alive and exciting, more critical and penetrating, and more open to fresh and original thinking. Furthermore, the type of inquiry pursued by a reflective class tends to be more rigorous and "work producing" than that pursued in an understanding-level learning situation.

Since reflection-level teaching procedures are more difficult to grasp and more prone to be misunderstood than those of the other two levels, the last section of the chapter is devoted to their expansion and evaluation. But first let us examine very briefly how evaluation of students' achievement is related to the three levels of learning.

HOW DOES EVALUATION AFFECT TEACHING AND LEARNING?

A teacher's program of evaluation not only governs his students' study habits, their manner of interaction in class, and the number and quality of their learnings; it also largely determines whether they will pursue learning on a memory-, understanding-, or reflection-level. A student tends to gauge the level of his learning to the level of tests that his teacher uses; this is where the pay-off occurs.

Since the nature of a teacher's system for evaluation of students' learning greatly influences the quality of learning which actually occurs, a teacher should give careful thought to his evaluative pro-

TABLE 2. Levels of Teaching and

Level of Teaching	Nature of Learnings	Nature of Appropriate Tests
1. Memory	Factual materials	Factual essay or short-answer completion
2. Understanding, insightful	Understandings, insights, principles, relationships, concepts, generalizations, rules, laws, theories	Factual and explanatory essay or short-answer true-false, selection, or completion
3. Reflection, problem-centered, exploratory	Purposely acquired understandings, insights, principles, relationships, rules, laws, theories, *plus* enhanced independent thinking and scientific outlook	Reflective, or problem-centered essay

cedures. Although there are many different techniques and instruments for evaluating student progress, formalized testing continues to hold the most prominent position of them all—particularly in the minds of students. And testing, like teaching, may be conducted on any one of the three levels.

Table 2 lists the three levels of learning and the nature of learnings and testing items which harmonize with each. Regardless of the level of learning which is pursued, we should bear in mind that students need facts in order to understand anything and, furthermore, they need both facts and understandings in order to learn reflectively. However, teachers need not be reluctant to experiment with understanding- and reflection-level teaching for fear their students will not learn a sufficient number of facts.[3]

When students are taught and tested on the reflection level, they also achieve understandings and facts, and when they are taught on the understanding level, they also achieve much factual information.

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[3] We refer the reader to the Bayles studies reported on pages 348–350.

Appropriate Learning and Testing

Basis for Appropriateness of Test Items	Method of Test Evaluation
Recall of retained memories	Check student answers against list prepared at time test is made
Recognition, explanation, or use of understandings, insights, principles, generalizations, rules, laws, or theories	Check student answers against prepared answers, but credit student for "right" answers even though he uses words other than instructor's—if answers are correct
Essay questions which are real problems for the students and pertinent to the study having been pursued; real problems involve both generalization and tool-use of ideas	Check answers on basis of criteria agreed upon prior to the test—probably adequacy of pertinent data applied to the solution and harmony of the data, problem, and answer

This process, however, does not work in reverse. There is little about factual learning as such which contributes to understanding, and little about teaching for understanding in a nonreflective way which contributes to a student's reflective powers and habits.[4]

HOW MAY TEACHERS TEACH REFLECTIVELY?

Since reflective teaching is problem-centered teaching, that which distinguishes reflective from nonreflective teaching and learning is the presence of genuine problems which students feel a need to solve. At the outset of study, a real question develops for which students have no answer, or at least no adequate one. And through the study the students and teacher, working cooperatively, develop a new or more adequate solution.

[4] See Ernest E. Bayles, *Democratic Educational Theory*, Harper & Row, 1960, chap. 14, "Appraisal of Pupil Progress," pp. 217–235, for an excellent discourse on the three levels of evaluation.

When reflective teaching is successful, students emerge with an enlarged store of tested insights of a generalized character and an enhanced ability to develop and solve problems on their own. The latter product is as important as the former. If only the first were accomplished, no claims could be made for reflection-level which could not also be made for understanding-level teaching. However, within genuine problem-centered teaching, students learn the very nature and techniques of problem solving processes. And, if well taught, problem-solving approaches and procedures carry over to be applied to a wide range of problems both in and outside school.

An understanding of how to solve problems according to principles of scientific reflection is perhaps the most useful intellectual tool a person can possess. If the central goal of education is to foster intelligence, reflective teaching should be the basic approach used by teachers everywhere. Let us visit a college class in introductory psychology being taught reflectively and see whether we can discern what is unique to reflective teaching procedures.

The problem of immediate concern to the class is, What is the nature of *mind?* Most of the students previously have adhered to a dualistic, mind-body view of man; they have held the idea that man is composed of two distinctly different kinds of substances—mental and physical. As mutual inquiry proceeds, the following discussion between the teacher and various class members ensues. When a student speaks, he probably is verbalizing the thoughts of most of his classmates. The teacher's goal is to help the students sharpen their insights in regard to the meaning of *mind*. The teacher speaks first.

"Mr. J., do you have a mind?"

"Why yes, I think so."

"Then, possibly, you can tell us what is mind?"

"It is the thing with which we think."

"You have said that mind is a thing. But a chair and a table are things. You were not referring to this type of thing?"

"No! I really meant that we think with the mind."

"What about the use of gray matter? Don't we think with our brains?"

"Well, yes."

"Then, if we think with our minds and we also think with our brains, they must be the same thing."

"No, they are not the same."

"In that case we must arrive at the conclusion that the mind is not a thing and we do not think with the mind?"

The teacher continues. "Are we able to store ideas and knowledge in the mind or are they stored in the brain? We are able to use our memory and imagination. Aren't these two different phases of thinking?"

"Yes."

"We have just said that we think with our brain. Thus, our ideas seem to be stored in the brain and not in the mind. Besides, there are ideas and knowledge in your textbook. But certainly your textbook does not function in any way like a mind. Is the mind separate from the body?"

"Yes, it seems to be."

"What makes you think so?"

"Well, we always think of mind as one thing and body as another."

"But we agreed that mind is not a thing."

"It just makes common sense."

"Is common sense a valid method by which to judge truth?"

"No!"

"You know that it was once common sense to believe that the earth is flat and that it is the center of the universe. You said that the mind is separate from the body or that it seems that way. Have you ever said to yourself that you are going to raise your arm and your arm rises?"

"Yes."

"And you have seen the effect of physical illness upon mental processes. Then, how can the mind and body be considered as separate? Obviously, there must be some connection if we continue to hold this theory."

"Has anyone ever seen electricity?"

"No."

"Will electricity flow through a copper wire?"

"Yes."

"And you know other facts about electricity and what it will do. This description of what electricity can accomplish makes it possible to describe electricity. Let us see if we can apply this same technique to our problem of mind."

"You said that you have a mind. What did you mean when you said that you have a mind? Did you mean that you act as if you have a mind?"

"Why, yes."

"How would you describe that action?"

"I act normally."

"In other words, the difference between the way you behave and the way someone behaves who we say has lost his mind is that you act in a sensible way. And how do you act if you are sensible?"

"I am reasonable."

"You say you act reasonably. But this does not completely describe your action. Therefore, let us look at your behavior from another angle. Imagine that you are looking at a tree. How do you know that the tree is a tree?"

"It looks like a tree and everyone agrees that it is a tree."

"Are you suggesting that such a simple object as the tree has a number of specific meanings?"

"Yes."

"For instance, you will know that a tree isn't metal, that it grows, that it has leaves in summer, and much other material of factual nature. In addition, you won't mistake a tree for anything else. Now, what does this tell you about the way you should behave with reference to a tree? What would you do with a tree?"

"I might cut it down for lumber."

"And you might use it for shade. But in any case, you will not try to eat a tree and you will avoid it if it stands in your path? If you understand the meanings which ordinarily are attached to the word tree and you act accordingly, it might be said that you are behaving intelligently. Couldn't this understanding of meaning be the function which we think of as mind?"

"Thus, we have arrived at our definition that mind is a function. We take it to be the function which makes it possible for us to anticipate future consequences of present or proposed lines of action. What is meant by predicting future consequences? Don't we mean that we try to comprehend meaning and use foresight? Then, if we act on the basis of our predictions can we be said to act intelligently?"[5]

Because of space limitation the discussion between students and teacher is to some degree in outline form. In actual practice there would be more "side trips," and many statements would be made which were not pertinent to the problem at hand. The latter part of the discussion particularly would be more involved and much longer than is reported.

Now, just what is there about this teacher-student reflective classroom procedure which makes it different from either memory- or understanding-level teaching? *Perhaps it could be summarized*

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[5] Unit originally written by Leslie A. McKinnis quoted from Ernest E. Bayles, *The Theory and Practice of Teaching,* Harper & Row, 1950, pp. 272–274.

by describing the classroom atmosphere as one of teacher-student mutual inquiry within which genuine problems are developed and solved.

Problem-centered teaching, then, involves problem raising and problem solving. In problem-centered or reflective classes, instruction begins with introduction of an "I don't know," or problematic situation—one in which students are faced with a question they cannot answer. The problem should be so compelling that students really want to study it, but not so overwhelming that they are prone to give up; it should generate an urge to analyze the possible obstacles and dilemmas in the situation, to understand them, and to devise means for resolving the difficulties. After aiding students in raising a problem, the teacher then helps them investigate it until an answer is found. Problem solving consists of the steps of formulating hypotheses and testing them with all available pertinent evidence. Facts are gathered in profusion, but teachers make no attempt to encourage fact learning or fact recall *as such*. Problems which make for ideal classroom study involve situations which are difficult enough to be challenging, yet simple enough that most students in a class will be able to cast and test hypotheses leading to a solution.

When Is a Problem a Problem?

Too many teachers who have attempted a problems approach to teaching have not adequately understood the psychology of learning as it relates to problem-centered study. Older psychologies—mental discipline, apperception, and behaviorism—had little to say about problem-centered study. Nor have neobehaviorists, with their more sophisticated S-R associationisms, contributed much understanding of reflective teaching. Prior to the twentieth century, Herbart probably came closer than any other psychologist or educator to formulating a problem-centered approach to teaching, but even Herbartian teaching was not problem centered or reflective in any true sense.

Often "problem-centered teaching" has failed because what teachers have chosen as "problems" have not actually been problems in a psychological sense. Contributions of Gestalt and field psychologists enable us to understand better what happens to a person psychologically when he has a problem. A learning problem is not just an objective issue to be resolved; it must involve *psychological tensions in a learner.*

If a learning problem can be defined successfully in psychological terms, this should help resolve a common dilemma which arises in connection with a problems approach in teaching. The dilemma is this: students have a great variety of real problems, but often the "problems" which teachers think students should study arouse no tension in students; and if students do feel personally some of the problems posed by a teacher, they feel some much less intensely than others. Consequently, the motivation which should accompany problem study often does not develop; students remain cold and uninterested and their work proves to be lackadaisical. An analysis of pertinent psychological factors should help readers understand what lies behind this dilemma.

Some problems may be designated as *personal* in that students are personally involved and so experience tension, which is the essence of a true learning situation. While they are experienced, personal problems hold a central place in the life spaces of students. Another category of problems may be identified as *social* or *societal;* they represent social needs which some adults believe exist in a community, region, or nation. They constitute part of the social matrix and, as such, are at least in the foreign hulls of the life spaces of students. But often they constitute no part of their actual life spaces.

These problems are felt personally by someone or they never would have been identified as problems in the first place; but commonly they are perceived only by some adults, and sometimes only by experts in fields of knowledge relevant to specific questions. To students, societal problems often seem quite remote; the students' function of living does not bring them into play. Posed by a teacher, such "problems," unless students feel themselves personally involved with them, are not real problems at all.

STUDENTS NOT MOTIVATED BY "OTHER PERSONS'" PROBLEMS. Reactions of students to the two types of problems—personal and societal—are likely to be quite different. A student can see the point of studying problems with which he is personally involved. The necessary emotional steam already exists; often all a teacher needs to do is direct study so that it will be as mature as possible. But when students are asked to study problems which they do not accept as their own, they are likely to remain unresponsive; furthermore, since no personally felt goals are involved, an inwardly motivated search for solutions is unlikely. Because of this detachment, relevant facts are seen not as data contributing toward a solution but only as lessons to be learned. Consequently, the quality of learning which results when students study someone else's problems is likely to be little different from that produced by conventional textbook-recitation teaching.

However, there is little reason to suppose that, without skillful preliminary discussion led by a teacher, other persons' "problems" as stated will induce any significant kind of psychological tensions in students. All too often textbook writers, authors of syllabi and courses of study, and classroom teachers themselves label as problems exercises which, no matter what their potential in the teaching-learning process, cannot function *per se* as true psychological problems for students.

Since study of other people's problems results in learning which qualitatively is little different from traditional fact-memorization, some writers have suggested that teachers exclude from study any problem in which students do not already feel involved, and confine instruction to problems which students, because of their life situations, spontaneously feel. Thus, they argue that the role of a teacher is to help students define carefully problems which, for them, already exist, and then to help them conduct whatever research and discussion seem to be appropriate in solving these problems. Although it should not be denied that in any school there is an important place for this kind of problem study, exclusive emphasis on it is highly reminiscent of the Roussellian natural unfoldment outlook. There is a strong flavor of "letting students do as they please." Of course, in the hands of a capable teacher, considerable freedom may be permitted students in *selection* of their problems and at the same time considerable rigor demanded in their study.

NEED FOR CLASSROOM STUDY OF SERIOUS SOCIETAL PROBLEMS.

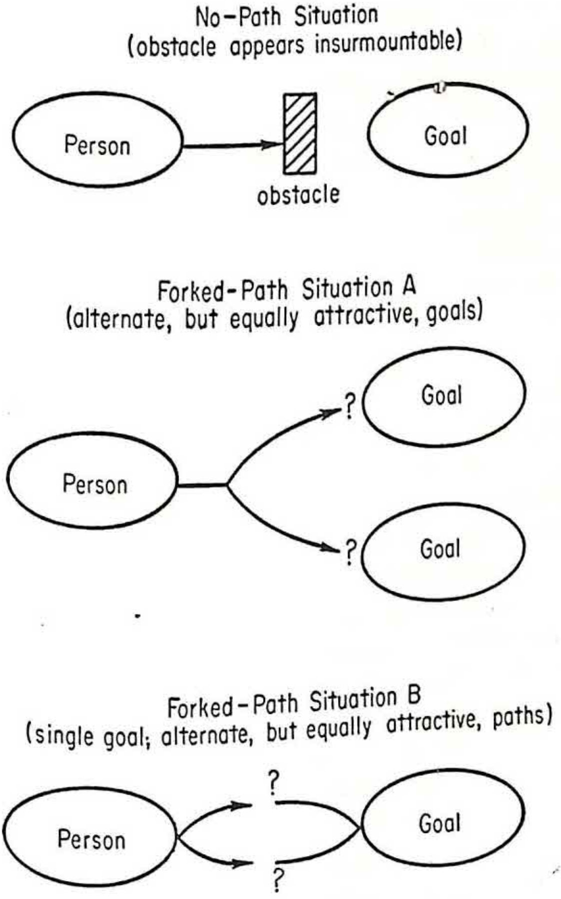
There are significant, persistent societal problems which, for the good of the community, state, and nation, students should come to understand and appreciate. Study of those problems about which normally only specialists or other adults are concerned may be of great importance in preparing students for intelligent citizenship. But how can we motivate students to study, in a serious and sustained way, problems which do not seem real to them? *In this question is the crux of problem-centered teaching.* Failure to give serious consideration to it is the reason why a problems approach so often bogs down, why students "goof off," and why, after having tried "problem-centered teaching" teachers frequently return to "teaching the facts straight."

In recent years, teachers have tried to devise ways of interesting students in problems which intrinsically are not challenging to them. "Solutions" to the enigma in which teachers find themselves have included suggestions that they explain to students just how the problems are bound to affect them eventually, that students be confronted face to face with the problems (as when we take a class to visit a slum), and that teachers use more eyecatching teaching materials (such as pictures).

But as every practicing teacher knows, these "solutions" often fail to produce real intellectual involvement. Students still do not feel the problems as their own. Of course, some students always will do whatever work a teacher assigns, and seemingly do it with enthusiasm. But what seems to be intellectual involvement and a desire to study a genuine problem often is a desire to achieve other goals, such as high marks, praise, and social status.

Instead of his striking out blindly and trying everything he can think of, willy-nilly, to motivate students to study seriously what does not seem to them any of their own concern, a teacher could try a drastically different approach; he could view his teaching problems in the light of a clear and adequate understanding of the learning process. Basic to such understanding would be knowledge of what it means for a person to experience a problem as a felt tension, and formulation, based on this knowledge, of an approach to teaching which holds promise in many cases of effectively translating the "problems of others" into the problems of students.

HOW IS A PROBLEM A FELT TENSION? To have a problem, a person must first have a goal or goals which he accepts as his own. A problem arises when he finds it impossible to proceed quickly and directly to a goal. When he cannot achieve his goal readily, it is either because he sees no open path to it or because he sees two or more competing paths, or two or more competing goals, and cannot decide which to pursue. These are the familiar "no-path" or "forked-path" situations described by John Dewey, and diagramed in Figure 11.1.


No-Path Situation
(obstacle appears insurmountable)

Forked-Path Situation A
(alternate, but equally attractive, goals)

Forked-Path Situation B
(single goal; alternate, but equally attractive, paths)

FIGURE 11.1 *Dewey's Problematic Situations.*

PROBLEMATIC SITUATIONS DEFINED IN LEWINIAN TERMS. Lewinian, cognitive-field concepts and terminology also may be used to express the basic elements of a problematic situation. Either there is a goal region in a person's life space which has a positive valence and a barrier between his person and the region of positive valence, or there are several conflicting goal regions toward which or away from which a person might want to make psychological movement. These two types of situations are barrier or no-path situations and conflicting path situations and are shown in diagram form in Figure 11.2.

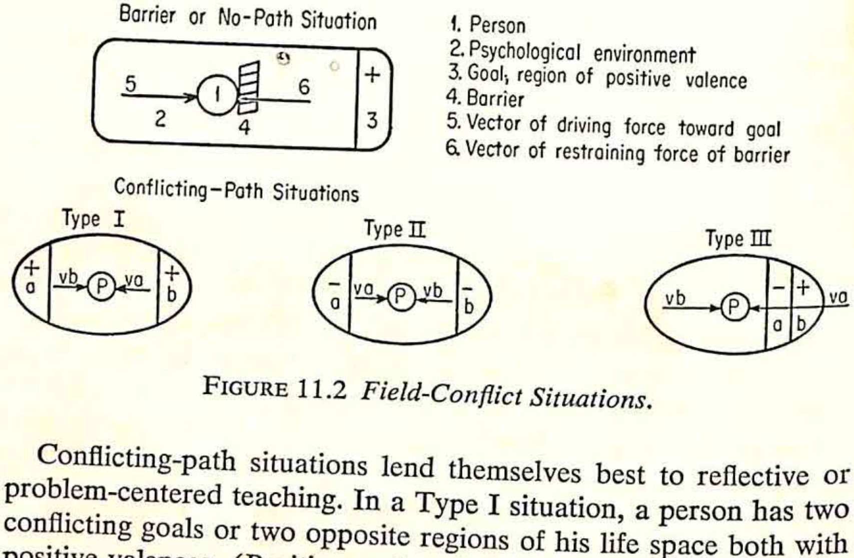

Barrier or No-Path Situation
5
1
6
+
2
4
3
1. Person
2. Psychological environment
3. Goal; region of positive valence
4. Barrier
5. Vector of driving force toward goal
6. Vector of restraining force of barrier
Conflicting–Path Situations
Type I
+ a
vb
P
va
+ b
Type II
− a
va
P
vb
− b
Type III
vb
P
− a
+ b
va

FIGURE 11.2 *Field-Conflict Situations.*

Conflicting-path situations lend themselves best to reflective or problem-centered teaching. In a Type I situation, a person has two conflicting goals or two opposite regions of his life space both with positive valences. (Positive goal regions being opposite means that both cannot be achieved at the same time.) In the Type I illustration, vector *vb* represents a psychological force equal to the valence of region *b*, and vector *va* represents a force equal to the valence of region *a*. In a Type II situation, the person is faced with two opposite significant regions of his life space each having a negative valence; he wants to escape both, and they are of such nature that this is impossible. In a Type III situation, a region of positive valence and a region of negative valence are in the same psychological direction from the person; they are functionally similar.

Movement toward or away from those regions will be determined by the relative strength of the two forces at the time of movement.

Superficially, Type I and Type II situations appear much alike; however, they are crucially different. A person in a Type II situation is like a ball being pushed from opposite directions by two sticks; once it gives a little, it flies off to the side out of the picture. A person in such a situation is trying to escape two opposite negative driving forces and so is "between the Devil and the deep blue sea." He is likely to become completely frustrated and, like the ball, leave the field. In contrast, a person in a Type I situation, like a ball being pulled in opposite directions, usually will stay in the field, that is, remain engaged with the problem and try to resolve his conflict. He is influenced by two goals, both with positive valences. The goal toward which he moves is the one with higher value or valence. (Should his two opposing goals be exactly equal, would he be like the donkey who starved to death while standing exactly halfway between two stacks of hay?)

WHAT LEVEL OF TENSION IS BEST? A characteristic of the kind of goal-centered situation which we have described is the presence of a certain amount of felt tension or discomfort. A person confronted with a no-path or forked-path situation feels to some degree doubtful, puzzled, bewildered, uncertain. How strongly he feels this way depends upon at least three factors: (1) desirability of the goal or goals; (2) apparent difficulty of the obstacle; and (3) his own personality make-up. Depending upon circumstances, desire to move toward the goal in a problematic situation (such as is diagramed) may range from a mild and easily cast off tickle to a powerful urge capable of commanding all one's resources. Or a problematic situation may cause a person to flee—leave the field—physically or psychologically, or both. He gives up; he makes no effort to achieve the goal. Whether a person finds himself between opposite positive goals which he is trying to achieve or opposite negative aversions which he is trying to escape depends largely upon how he construes himself and his environment.

In a sense a teacher must be a tightrope walker. He will get best results if he keeps his students under a "full head of steam." When he has involved them to the point that, during discussions, they sit on the edges of their seats, arms waving and eyes glistening, all wanting to talk at once, he has a potentially fine teaching situation. When he achieves this kind of situation, he may be sure that intrinsic motivation, at its best, is operating. However, there is a rather fine line between this type of situation and situations in which students either become so excited that their emotions are chaotic, feel despair because the problem posed is too difficult, or are bored because it is too easy. In any of these instances, a worthwhile teaching-learning situation can evaporate suddenly. The situation either gets out of hand or students become apathetic.

Necessity for maintaining control of students cannot be overemphasized. One of the difficulties which commonly arises when a teacher attempts reflective teaching is loss of control. Any class engaged in problem-centered study will seem rather disorderly, but teachers often mistake unproductive chaos for healthy, work-related disorder. When youngsters are either bored or highly excited, they are difficult to manage. A teacher following the reflective approach usually learns from experience when it is time to sidetrack a discussion that is producing too much heat.

We have been considering when a problem is a problem and how it involves felt tension. We now turn to description of the basic procedure for reflective teaching, which includes both problem-raising and problem-solving aspects. *Problem raising* is a process of discovering and identifying inadequacies and disharmonies of outlook or insights; *problem solving,* in turn, is a process of reconstructing outlooks or insights to make them more adequate and harmonious.

How Does Problem Raising Proceed?

For a student, a problem arises whenever he can be induced to feel dissatisfied (that is, in doubt) with some one or more of his present attitudes, values, beliefs, or items of knowledge. Introduction of dissatisfaction produces a forked-path or a no-path situation. Is the questioned attitude, value, belief, or knowledge valid, or is it not? Is some alternative more promising than others? In adherence to a certain pattern of thought, is there a basic contradiction which stands in the way? In this sort of situation it is the element of uncertainty that provides the problematic aspect. The goal of learning now becomes the desire to remove doubt, to restore a degree of certitude.

Very often, doubt can be induced by leading a student to see that he simultaneously holds contradictory attitudes, beliefs, or items of knowledge, or that his behavior does not square with what he says are his convictions; by being made aware of his inconsistency, he is made doubtful. There appears to be something in the make-up of most persons in our culture—not yet well understood—which, once inconsistency is clearly recognized, produces a desire for consistency, a desire for a sense of personal harmony, for integration of self. When, over long periods of time, people display gross inconsistencies without appearing to feel unhappy, it is usually because they simply do not see themselves as being inconsistent.

Before a teacher can do much about helping students see their inconsistencies, he needs a pretty good idea of what to expect, what kinds of contradictions his students are likely to hold. This knowledge will enable a reasonably skillful teacher to pursue a line of discourse and questioning which exposes a student's inconsistencies to himself. Some techniques for raising problems in the thinking of students are use of a *subject matter switch,* introduction of *disturbing data,* and permitting students to *make mistakes.*

A SUBJECT-MATTER SWITCH. A subject-matter switch is performed when we generalize, or reduce to principle, a particular idea, then demonstrate how a further thought is incompatible with the principle and, consequently, with the first idea. For example, a student expresses the opinion that "Government price supports for cotton are ridiculous." The teacher then seeks agreement with the principle that "The federal government should not interfere with the economy." If the student agrees, the teacher then places the principle in a different context, that is, gives it different subject matter, with a question like, "Do you favor a protective tariff on cotton?" The student, who also adheres firmly to the principle "A high protective tariff brings prosperity to a nation," is thus placed in a position which forces some kind of revision (if he attempts to extricate himself) of one or both of the contradictory opinions.

The foregoing example is hypothetical and, of course, very much simplified. To make the contradiction explicit to most students in a class, much more discussion would be necessary. Furthermore, this example, and any other which we might substitute, can be misleading. A teacher may ask questions which appear to reveal a contradiction that actually does not exist. If a student is permitted to qualify his opinions by introducing exceptions, he may extricate himself readily without having to do any serious thinking. On the other hand, the general technique of the subject matter switch is useful, and every teacher should experiment with it. Often, when it does not provoke the particular student who is trapped by it to constructive thought, it will motivate other students in the class.

In the preceding sentence we use the word *trapped* advisedly. Yet some explanation is needed. A teacher who wishes to teach reflectively is probably justified in using any device which works to get reflection going. Some devices may seem so teacher-centered —that is, the teacher is so fully in charge—that the whole procedure appears to be rigged in favor of the teacher's biases. But remember that this is only the beginning. When it comes time to cast and scrutinize hypotheses and draw conclusions there can be no rigging. Although the teacher performs key functions throughout the process, the relationship between students and teacher is interactive. Students remain free to reach whatever conclusions they choose, when the teacher sees to it that they give reasoned consideration to alternatives and the data which support them.

INTRODUCTION OF DISTURBING DATA. Another means of inducing students to feel problems is to introduce them to data from outside their life spaces which have the effect of making them doubt some attitude, value, belief, or supposed item of knowledge. In other words, the teacher asks students to read a book, to watch a television program or motion picture, to go on a field trip, or to engage in some other activity which confronts them with facts contrary to what they have taken for granted. Of course, this approach, like any other, may not work; students may refuse to admit the new facts into their life spaces. Unless they recognize the significance of the facts and truly come to doubt, no problem is created. Use of negative evidence to shake the confidence of students in their own knowledge and beliefs is often more effective if evidence comes from some source other than the teacher; for example, other students or reading references.

PERMITTING STUDENTS TO MAKE MISTAKES. Making a mistake often encourages us to re-examine something we had regarded as true. Teachers usually do not let students make enough mistakes. They tell them the "right way," and students follow more or less blindly. It often is much more educative to let students do something their own way and experience the consequences. Of course, some situations preclude this. A shop teacher might achieve maximum motivation for study of safety practices by first allowing a student to cut off a finger with a power saw; but he would not be morally justified in using such means to establish an efficient learning situation. However, a teacher has many opportunities to permit students to make "problem-raising" mistakes without endangering anyone.

Because of the demise of several fish in the classroom aquarium, a class of fourth-graders embarked upon an enthusiastic study of the biology and ecology of fish life. The students had been caring for the fish according to what they thought were "right principles" (which included the assumption that fish need to eat as much in proportion to size as do fourth graders). The teacher, whether or not by design, allowed the children to make a mistake—to overfeed the fish. He then posed the question, "Why did the fish die?" and thereby launched a reflective study.

We wish to emphasize the role of question asking in any problem-centered teaching. Students (and often the teacher) ask questions persistently, but the teacher usually refuses to offer fixed answers. The essence of a problematic situation is that there is something in it which is unknown. The unknown can be uncovered only after right questions are asked. One of the best questions is also the simplest: "Why?" "*Why* did you say that?" "*Why* do you have the opinion you have stated?"

How Does Problem Solving Proceed?

Problem-centered teaching does not end with induction of psychological tensions. Helping students feel problems is only a beginning; this aspect provides motivation and direction for the problem-solving aspect of reflective inquiry. Once doubt has been induced, reflective teaching and learning enters its second important step. Students are encouraged to formulate as many hypotheses—considered guesses or hunches—as possible which might resolve the discrepancies in thought that have been exposed. Or, in many instances, students formulate questions, that is, "negative" hypotheses, the answering of which will solve the problem. In the third aspect of reflective teaching, *students are encouraged to examine the hypotheses, or answer the questions, in the light of all obtainable, pertinent evidence.* Formulation and testing of hypotheses should be conducted in an atmosphere which, as far as possible, resembles that of a scientific laboratory; the same open-minded and objective attitudes which characterize any scientific investigation should prevail.

We should note carefully that, in the process of testing hypotheses, a teacher does not play the role of a softhearted baby-sitter. At times he must be quite tough-minded in his insistence that students examine and think about all pertinent available evidence. He also must guard against snap conclusions and any other liberties which students might want to take with the reflective method.

Ideally, problem-centered study should culminate in at least a tentative conclusion about how a problem might be alleviated or solved; however, in many instances a definite conclusion will not be achieved. Any conclusion reached at the termination of an inquiry should be a warranted assertion; it should provide greater predictive accuracy than any alternative hypotheses which has been entertained and examined. A conclusion may involve reacceptance of the idea originally brought under question, modification of the idea, or formulation of a substitute one. The important concern is that students push their thinking farther than it had gone before. Reaffirmation of an idea which a teacher has induced students to doubt is equally acceptable, provided that in the course of their study the students come to understand the idea better and to have a better grasp of pertinent evidence.

We should stress two points regarding the over-all process of reflective, problem-centered study. One relates to thoroughness and the other to orderliness.

THOROUGHNESS AND REFLECTIVE TEACHING. When a teacher and a class of ninth-graders purport to "solve" some highly difficult problem during the course of a unit of study which covers a period of, say, three days, we can only feel that the procedure has been a travesty on education. It is conceivable that students might inform themselves a little better, might push their thinking forward a little more, in this length of time. But to talk about their achieving solutions so quickly is nonsense. True problem-centered teaching, like any teaching which leads to understanding, is necessarily an unhurried procedure. Consequently it is very difficult, and usually impossible, to pursue problem-centered teaching in situations characterized by rigid scheduling of time or units to be covered.

To make problem-centered teaching click, a teacher may need to make several false starts; when one plan for bringing students to feel a problem fails, he tries another until he hits on one that works. The period during which a given problem is studied is necessarily rather unstructured and it frequently is impossible to predict how soon a class will devise anything resembling an answer. Even though a problem has been under study a week or more and nothing educational seems to have happened, so long as the teacher feels there is still a chance that some useful insights will emerge, study should be continued.

The length of time students struggle with a problem depends upon their age and maturity. First-graders need to come to a conclusion soon after they develop a problem, perhaps the same day. However, college seniors may accomplish their best learning when they have struggled with a problem for a semester or longer.

As a practical matter, of course, there must be limits to thoroughness. Something like a "law of diminishing returns" operates in education; in connection with each problem, a time is reached when further pursuit of the problem obviously will not be worth the time and effort involved. Other equally important problems may be pressing for attention.

Most textbooks and courses of study contain entirely too many topics for each to be treated in problem-centered fashion. Thus teachers who wish to experiment with problem-centered teaching must free themselves somewhat from the dictates of standard printed guides (textbooks, courses of study, state curriculum frameworks). This does not necessarily mean ignoring such guides, which seldom is possible anyway, but rather using them judiciously with clear recognition that they need not be followed literally.

ORDERLINESS AND REFLECTIVE TEACHING. Problem-centered study is rarely, if ever, as orderly as written descriptions of it imply. To realize this, one needs only to listen carefully to a group discussion of some matter about which most members of the group have a sizable personal concern. Hypotheses are advanced, evidence is stated, and conclusions are suggested in what appears on the surface to be random order. Thought, even for the best-organized persons, is seldom completely ordered in a one-two-three fashion. Although we may list a series of aspects involved in reflective thinking (corresponding to aspects of scientific procedure), they are rarely steps taken in their "logical" order. A thinker moves continuously back and forth from problem to hypotheses to evidence to conclusions in varying order, and at any given moment an idea may strike him which sets off an entirely different train of thought (sometimes about a quite different problem).

In good group inquiry there are always two types of discussion in progress—one the public discussion which an observer can hear, the other a series of private discussions in which each interested student debates the issue with himself. Most of the questions and assertions which are uttered aloud emerge from, or are influenced by, the private, silent debates. An aim of vocal discussion is to help each individual in the classroom, including the teacher, push forward the thinking he is doing privately. Hence, during the course of a single discussion, Mary may reach a conclusion which seems satisfactory to her, John may have his faith badly shaken in a conclusion he once had, and Fred may merely formulate a hypothesis. In each case, the student may have thought the problem through to a point farther advanced than any previously reached by him. Hence, in a discussion which appears chaotic to an observer, individuals may achieve a considerable amount of pointed thinking.

After stressing the inevitable appearance of disorderliness which characterizes most highly motivated discussions, we must not forget that a teacher is obligated to preside in such way as to see that appropriate questions do get asked, that obvious hypotheses are not ignored, that pertinent evidence is not glossed over, and that conclusions are presented and debated (where conclusions seem warranted). In short, he is obligated to see that all aspects of reflective study are evidenced at some time during the public part of a discussion. Only then will individual students have available for their private reflection all that a group study situation can contribute.

Although in the foregoing paragraphs we have concentrated upon the discussion aspect of reflective teaching, we wish to emphasize that, provided the teacher promotes an atmosphere of mutual inquiry, problem-centered study in school may encompass a variety of activities. It is likely to include periods set aside for individual or group research, home study, trips, and guest speakers. It may even include considerable talking, explaining, and illustrating on the part of a teacher, an informal lecture can be a highly useful tool for providing data for students' consideration and for instigating and promoting their reflection.

In What Subject Fields Is Problem-Centered Teaching Applicable?

Many teachers see problem-centered teaching as a possible approach to instruction in a very limited number of courses, such as social studies, literature, industrial arts, or home economics. These teachers are unable to imagine the use of problem-centered teaching in such subjects as mathematics, physics, music, physical education, and foreign language. However, such teachers have an inadequate conception of reflective teaching procedures.

With respect to subject areas, it appears that the essential characteristics of problem-centered teaching have enough flexibility to be employed in all school subjects, including those which seem on the surface to be rather cut and dried. Problem-centered teaching does not require development of elaborate unit plans. It emerges whenever a teacher, through adroit questioning and use of negative evidence, induces students to doubt that which they now accept, and then helps them analyze reflectively the issue which has arisen. In most conventional subjects, opportunities regularly appear for a teacher to operate in this manner. Passages in a textbook, assertions made by students, a news story, a motion picture or TV show—any of these may serve at times as a "springboard" for creation of problems. Problem-centered teaching seems to spring into existence in those situations where minds of teacher and students engage. *It grows more from a unique relationship between teacher and students than from any different nature of formal course materials.*

Of course, some courses and some types of course organization lend themselves more readily to problem-centered teaching than do others. A course which has been construed broadly—that is, whose subject matter is not narrowly prescribed—is probably a better tool than is a more narrow course. Thus, as usually defined, general business is a better course for reflection-level teaching than is shorthand; problems of democracy better than economic geography; history and philosophy of mathematics better than algebra; world literature better than freshman composition. This difference, however, is not inherent in the nature of the subject matter as such but lies in the frame of reference within which it customarily is treated.

A course in which problem-centered teaching is used cannot be bound rigidly to a textbook. Real problems are psychological; data used in solving them are rarely organized in the same pattern as textbooks and courses of study. The "logical" organization of a book simply does not usually coincide with the logic of live thought. Hence, courses are best which may be allowed to cut across subject matter lines whenever the cutting across makes sense in terms of the particular problem being studied. This perhaps is the most defensible rationale of a core curriculum.

Determination of which subjects, or which topics within a subject, should be handled as problems cannot be made without reference to a specific classroom situation. In each case, a teacher should reckon with the maturity and experiential background of students, community attitudes, his own preparation and skill, and anticipated consequences of having a class delve deeply into the subject.

How Effective Is Reflective Teaching?

A person who experiences reflective learning should thereby gain an increase store of generalized insights related to the subject studied, and these should be incorporated at the personality level so that a permanent change in him occurs. Furthermore, he should show a greater disposition and ability than before to apply the method of scientific reflection to problems in and outside the school subject in which reflective learning occurs.

The best sources of evidence as to the effectiveness of reflective learning are the subjective reactions of students themselves, the reactions of teachers and administrators, and the results of objective studies of the accomplishments of reflective teaching as compared with those of the other two levels.

SUBJECTIVE STUDENT REACTION TO REFLECTION-LEVEL TEACHING. How does a student feel toward a course taught reflectively compared to one taught on a memory or understanding level? Students react to reflective teaching in various ways, but usually with intensity. Some of them despise their first experience in a reflectively taught course—but not because of boredom. Students who actively dislike reflective situations usually do so because such situations encourage them to think about ideas which they would prefer not to expose to rigorous examination. Other students react positively and express gratitude for having been "made to think." In fact, some conclude that they "will never again be quite the same." A third group, the lesson learners, prefers to have the answers given to them completely predigested. Members of this group probably are victims of habit; through experiences of the wrong kind they have learned to work for grades rather than insights.

REACTIONS OF TEACHERS AND ADMINISTRATORS TO REFLECTIVE TEACHING. Adherents of reflective teaching agree that students need facts to think with, ideas from which to feed, and understandings from which to develop new insights, and they think that reflective teaching is the best instrument for achievement of necessary facts, ideas, and understandings. They are convinced that even facts are learned best when they are pertinent to meaningful, problem-centered study. Furthermore, they think that, in addition to the unique nature of its teaching-learning process, there are other advantages of reflective teaching. If conducted in the right manner, it produces a high level of motivation in most students. This leads them to work with a great deal of perseverance and tends to eliminate discipline problems. Students often become so "fired up" in problem-centered classes that they do twice as much work as would normally be expected, sometimes to the point of neglecting other classes. Work in a reflectively taught class also is likely to be more self-directed and self-sustained than in nonreflective classes. That is, students voluntarily dig for information in libraries and elsewhere. Furthermore, they hold frequent out-of-class discussions concerning their work in class, with cross-fertilization of ideas contributing to their learning.

Of course, not all attempts at reflective teaching work out so well. In fact, the "problems approach," as it has been called, is in bad repute among some teachers and administrators. The most common charges leveled against it is that students fail to acquire the basic background—principles and facts—essential to a subject. Now what do studies of the results of reflective teaching show in this regard?

STUDIES OF THE RESULTS OF REFLECTIVE TEACHING. It might seem logical to assume that, on a test designed to measure recall of facts, students taught on a memory or an understanding level would fare better than those taught reflectively. However, if we are to take at face value a group of studies extending from 1940 into the 1950s, this apparently is not the case. These studies, all designed to test the results of reflective teaching, have been reported by Bayles.[6]

The studies were conducted by public school teachers in Kansas and Missouri and culminated in the form of master's theses. Four of the six studies reported were conducted in high school social studies and the other two in fifth- and sixth-grade classes.

The general procedure was as follows: students were given IQ tests to determine the average IQ of a class. Only those classes were used which were approximately "average." Then, insofar as the teachers were able to do so, the classes were taught reflectively. The teachers measured the effects of reflective instruction by giving various standardized achievement tests and by observing such changes of students' overt behavior as made it possible to infer the quality of their learning.

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[6] "Experiments with Reflective Teaching," *Kansas Studies in Education,* April, 1956. This monograph is reproduced in essentially its original form in chap. 1 of Bayles' book *Democratic Educational Theory,* Harper & Row, 1960.

The control group used in evaluation of test results was in each case the group upon which the test had been standardized. All tests used had been standardized on groups of students of average or better IQ. The control against which teachers judged student behavior was much more subjective—the behavior of students of other classes which the teachers had taught in conventional fashion. However, since each of the teachers was experienced and able, subjective impressions reported by them were considered worthy of respect.

The results of each study were very clear cut. Irrespective of whether the achievement tests emphasized fact recall or the application of principles, students who had been taught reflectively scored conspicuously higher in almost all cases than the national or regional norms. Those who did not actually score higher than the norms made exceptionally large gains during the school term. With respect to informally gathered data, teachers reported the following results: (1) apparent heightened interest among students; (2) more work done; (3) more voluntary reporting of data which had been encountered out of school—data gathered from radio, newspapers, magazines, and so on; (4) increased tendency to be critical—to demand evidence; (5) increased participation in discussions, particularly among students formerly reticent; and (6) much more reading. Some of the teachers obtained librarians' records of magazines and books checked out by students; they found that those in their reflectively taught classes were reading more than any other students in school.

To measure the amount of gain during a term, one of the investigators continued for a period of six years to give achievement tests to respective classes at the beginning and end of each school term. She found that the net gain in learning increased from year to year. This indicated that with continued experience with reflective teaching a teacher becomes more effective. If the six teachers participating in these studies had had several years of reflective teaching experience behind them (most were trying it for the first time), it seems likely that the studies would have revealed even more spectacular results.

Many teachers, when discussing the merits of reflective teaching, argue that it works only with the best students. One of the studies reported by Bayles suggests that this is not true; in the instance reported, reflective teaching was used in a class containing a wide range of ability. *Students of low ability made greater percentage gains than did those of high ability*. However, the investigator concluded that her teaching had not been pitched on a challenging enough level for the high group. Probably a safe conclusion is that reflective teaching, when effective, tends to bring students of all levels of ability up to maximum or near maximum performance.

We shall mention only one more conclusion, but it is a significant one. The teachers who participated in the studies which Bayles reports adapted reflective teaching to school situations which were quite conventional. The fact that they achieved good results suggests that effectiveness of teaching in our public schools could be greatly increased without drastically upsetting the conventional framework of subject matter and school organization. It is reasonable to assume that, in a school administratively committed to reflective teaching, results would be even more impressive.

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